



Department of Energy
Washington, DC 20585

June 23, 2005

Mr. Robert A. Pedde
President
Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

Dear Mr. Pedde:

This letter responds to your January 26, 2005, request for exemption from certain provisions contained in title 10, Code of Federal Regulations, part 835 (10 CFR 835), "Occupational Radiation Protection." The purpose of the exemption request is to permit Westinghouse Savannah River Company (WSRC) to use the weighting factors found in International Commission of Radiolgical Protection Publication 60, "1990 Recommendations of the International Commission on Radiological Protection," for detemining radiation dose from intakes of radioactive materials.

The Office of Environment, Safety and Health conducted a Technical Review (enclosure 1) of the exemption request. Staff from the Office of Environmental Management concur with this Technical Review and Exemption Decision (enclosure 2). Based on the review of the information that was provided, the Assistant Secretary for Environment, Safety and Health is granting WSRC an exemption, with conditions, from the applicable provisions of 10 CFR 835.

The National Nuclear Security Administration (NNSA) also reviewed the information and concurs with the enclosed Technical Review and Exemption Decision. Accordingly, the Deputy Administrator for Defense Programs, NNSA, also grants the exemption, with the same conditions, for the WSRC NNSA facilities.

Sincerely,

John Sataleri Shaw
Assistant Secretary for
Environment, Safety and Health

Thomas P. D'Agostino
Acting Deputy Administrator for
Defense Programs
National Nuclear Security Administration

2 Enclosures

cc w/enclosures:
See attached sheet.



Printed with soy ink on recycled paper

Technical Review

Westinghouse Savannah River Company (WSRC)
Title 10, Code of Federal Regulations, Part 835 (10 CFR 835)
Exemption Request

On January 26, 2005, Westinghouse Savannah River Company (WSRC) requested exemption from certain provisions of 10 CFR 835, "Occupational Radiation Protection." WSRC requested exemption from certain requirements for controlling and determining individual doses from intakes of radioactive material. Based on a review of the material provided, the Office of Worker Protection Policy and Programs (EH-52) concurs with this exemption request, with conditions.

Discussion

Specifically, WSRC requested, for the Savannah River Site (SRS), an exemption from the requirements in 10 CFR 835.2 and 835.203(b), which specify the set of tissue and organ weighting factors required to calculate internal doses. In place of this set of tissue and organ weighting factors, WSRC proposed to use the set specified in Publication 60 of the International Commission on Radiological Protection (ICRP), "1990 Recommendations of the International Commission on Radiological Protection."

Requirements from which Exemption is Sought

10 CFR 835.2, "Definitions"

(b) As used in this part to describe various aspects of radiation dose:

Weighting factor means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue. The dose equivalent to tissue is multiplied by the appropriate weighting factor to obtain the effective dose equivalent contribution from that tissue. The weighting factors are as follows:

WEIGHTING FACTORS FOR VARIOUS ORGANS AND TISSUES

| Organs or Tissues | Weighting Factor |
|--------------------------|-------------------------|
| Gonads | 0.25 |
| Breasts | 0.15 |
| Red Bone Marrow | 0.12 |
| Lungs | 0.12 |
| Thyroid | 0.03 |
| Bone Surfaces | 0.03 |
| Remainder ¹ | 0.30 |
| Whole Body ² | 1.00 |

¹ “Remainder” means the five other organs or tissues, excluding the skin and lens of the eye, with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, and upper large intestine). The weighting factor for each remaining organ or tissue is 0.06.

² For the case of uniform external irradiation of the whole body, a weighting factor equal to 1 may be used in determination of the effective dose equivalent.

10 CFR 835.203, “Combining internal and external dose equivalents”

- (b) Determinations of the effective dose equivalent shall be made using the weighting factor values provided in 10 CFR 835.2.

Analysis

Consistency with Criteria for Granting Nuclear Safety Exemptions:

In the request, WSRC provided information supporting that the criteria in 10 CFR 820, “Procedural Rules for DOE Nuclear Activities,” were met. WSRC stated that the exemption request meets one of the special circumstances listed in 10 CFR 820.62(d)(4). Specifically, WSRC stated that the exemption request meets the special circumstance, which states that “the exemption would result in benefit to human health and safety that compensates for any detriment that may result from the grant of the exemption.”

WSRC noted that a primary benefit of this exemption would be the improved accuracy of dose assessments. While the Department of Energy (DOE) permits use of the most current models to describe the intake, uptake, and metabolism of radioactive material by the human body, the tissue and organ weighting factors needed to calculate committed effective dose equivalent (CEDE) are specified by regulation in 10 CFR 835. Tissue and organ weighting factors are primarily based upon the fraction of fatal cancers that occur in a tissue or organ in a human uniformly exposed to radiation. The tissue and organ weighting factors in 10 CFR 835 were originally published in ICRP Publication 26, “Recommendations of the International Commission on Radiological Protection” (1977), and are primarily based on studies of the Japanese atomic bomb survivors that had been performed during the mid-1970s. The tissue and organ weighting factors published in ICRP Publication 60 are primarily based on more recent studies of the Japanese atomic bomb survivor cohort. As this population ages, more cancers occur; and it is statistically easier to identify excess cancers that could be attributed to radiation exposure. Accordingly, the ICRP Publication 60 set of tissue and organ weighting factors is considered to be more accurate than the set of tissue and organ weighting factors currently in 10 CFR 835.

Granting the requested exemption would improve WSRC’s capability to assess internal dose and protect workers. In addition, WSRC does not see any detriment resulting from the use of the ICRP Publication 60 tissue and organ weighting factors and, thus, asserts granting this exemption satisfies the special condition listed at 10 CFR 820.62(d)(4). EH-52 concurs with WSRC’s assertion that using the ICRP Publication 60 tissue and organ weighting factors will improve the assessment of doses from intakes of radioactive material. DOE permits and encourages the use of newer internal dosimetry

methodologies in determining individual dose from intakes of radioactive material. Section 4.4.3 of DOE Guide G 441.1-3, “Internal Dosimetry Program Guide” (March 1999), states that methods for evaluating the various doses from intakes “should be based on recommendations given in ICRP publications, National Council on Radiation Protection and Measurements reports, and American National Standards Institute standards that embody improvements and updates of the science of internal dosimetry.” In addition, DOE-STD-1121-98, “Internal Dosimetry” (reaffirmed December 2004), also discusses use of current, appropriate internal dosimetry methodologies. DOE has chosen to limit changes to tissue and organ weighting factors by including those values in 10 CFR 835. The Nuclear Regulatory Commission took a similar approach in its occupational radiation protection rule. However, because of the benefit realized by using the ICRP Publication 60 set of tissue and organ weighting factors, EH-52 agrees that this change is warranted in the case of WSRC.

This exemption request proposes to replace the current set of tissue and organ weighting factors specified in 10 CFR 835 with a set of tissue and organ weighting factors based on more recent scientific research and understanding of radiation effects. Accordingly, EH-52 believes that the effectiveness of 10 CFR 835 is not diminished by instituting this exemption request, with the conditions specified below, and, therefore, accepts the WSCR determination that this exemption request:

- would be authorized by law [10 CFR 820.62(a)];
- would not present an undue risk to public health and safety, the environment, or facility workers [10 CFR 820.62(b)]; and
- would be consistent with the safe operation of a DOE nuclear facility [10 CFR 820.62(c)].

Consistency with Secondary Quantities:

In addition to changing the assessment of internal dose, adoption of updated methods for calculating internal dose (including adoption of the ICRP Publication 60 tissue and organ weighting factors) will result in changes to secondary radiation protection quantities that are based on internal dose calculations. Two such quantities, specified in 10 CFR 835, are derived air concentration (DAC) values (Appendix A¹) and values for establishing sealed source accountability and radioactive material posting and labeling requirements (Appendix E²).

The Appendices A and E values are used in various ways in 10 CFR 835 as criteria to trigger radiological protection requirement for the control of internal exposure. For example, DACs are used in establishing posting criteria for airborne radioactivity areas

¹ DACs are based on the annual intake of radioactive material that will result in a CEDE of 5 rem or a Committed Dose Equivalent of 50 rem to any organ or tissue.

² The Appendix E values for a specific isotope are based on the smallest quantity of radioactive material that will result, for a given scenario, in either an annual dose of 100 mrem CEDE from internal exposure or 100 mrem Effective Dose Equivalent from external exposure.

and for requiring air monitoring. In addition, DACs are used at various DOE sites as criteria for use of respiratory protection devices. Likewise, the Appendix E values are used in establishing criteria for posting radioactive material areas, and labeling radioactive materials.

EH-52 believes that the values in Appendices A and E used by WSRC at the SRS should be based on the same methods used to assess internal dose. This would maintain consistency throughout the Radiation Protection Program (RPP). For example, while the use of the more restrictive (lower) Appendix A DAC values would maintain compliance with 10 CFR 835, this approach could decrease the efficiency of radiation protection by triggering protective actions when they are not actually necessary. Conversely, using less restrictive (higher) Appendix A DAC values could result in a failure to trigger radiation protection measures at levels intended in 10 CFR 835. With regard to the values in Appendix E, the same logic applies.

Based on the above discussion, EH-52 concurs that a sufficient basis exists for granting the exemption requested by WSRC with the following conditions:

- WSRC should revise its RPP to require the use of ICRP Publication 60 tissue and organ weighting factors in the calculation of CEDE. They should revise the definition of “weighting factor” in 10 CFR 835 as follows:

Weighting factor means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue. The dose equivalent to tissue is multiplied by the appropriate weighting factor to obtain the effective dose equivalent contribution from that tissue. The weighting factors are as follows:

WEIGHTING FACTORS FOR VARIOUS ORGANS AND TISSUES^{1,4}

| Tissue or Organ | Tissue Weighting Factor |
|-------------------|-------------------------|
| Gonads | 0.20 |
| Bone Marrow (red) | 0.12 |
| Colon | 0.12 |
| Lung | 0.12 |
| Stomach | 0.12 |
| Bladder | 0.05 |
| Breast | 0.05 |
| Liver | 0.05 |
| Oesophagus | 0.05 |
| Thyroid | 0.01 |
| Skin | 0.01 |
| Bone Surface | 0.01 |
| Remainder | 0.05 ^{2,3} |

¹The values have been developed from a reference population of equal numbers of both sexes and a wide range of ages. In the definition of effective dose, they apply to workers, to the whole population, and to either sex.

²For purposes of calculation, the remainder is composed of the following additional tissues, and organs: adrenals, brain, upper large intestine, small intestine, kidney, muscle, pancreas, spleen, thymus, and uterus. The list includes organs that are likely to be selectively irradiated. Some organs in the list are known to be susceptible to cancer induction. If other tissues and organs subsequently become identified as having a significant risk of induced cancer, they will then be included either with a specific weighting factor or in this additional list constituting the remainder. The latter may also include other tissues or organs selectively irradiated.

³In those exceptional cases in which a single one of the remainder tissues or organs receives an equivalent dose in excess of the highest dose in any of the twelve organs for which a weighting factor is specified, a weighting factor of 0.025 should be applied to that tissue or organ and a weighting factor of 0.025 to the average dose in the rest of the remainder as defined above.

⁴For the case of uniform external irradiation of the whole body, a weighting factor equal to 1 may be used in determination of the effective dose equivalent.

- WSRC should revise its RPP to reflect that compliance with 10 CFR 835.203(b) will be achieved by adherence to the definition of “weighting factor” provided in its RPP.
- WSRC should revise its RPP to reflect that the DAC values and footnotes in Table 1 of this Technical Review (attachment 1) will be used in lieu of those in 10 CFR 835 Appendix A in those provisions of 10 CFR 835 requiring the use of Appendix A values.
- WSRC should revise its RPP to reflect that the values and footnotes for establishing sealed source accountability and radioactive material posting and labeling requirements in Table 2 of this Technical Review (attachment 2) will be used in lieu of those in 10 CFR 825 Appendix E in those provisions of 10 CFR 835 requiring the use of Appendix E values.

Based on the above analysis, EH-52 believes that a sufficient basis for granting the exemption has been established. Accordingly, EH-52 recommends approval of the WSRC exemption request with the conditions specified above.

WSRC should either implement this exemption so that it applies to internal doses resulting from all intakes in year 2005 or delay implementation so that it will apply to internal doses resulting from intakes that are received in year 2006. The term “year” is used as defined in 10 CFR 835.2(a).

Concurrence:

Consistent with the technical position provided above, EH-52 concurs with the subject exemption request.

Duration of Exemption:

Permanent.

2 Attachments

EXEMPTION DECISION

On January 26, 2005, the Westinghouse Savannah River Company (WSRC) requested an exemption from certain Department of Energy (DOE) requirements contained in title 10, Code of Federal Regulations, part 835 (10 CFR 835), "Occupational Radiation Protection." In particular, WSRC requested an exemption from requirements contained in 10 CFR 835.2(b) and 835.203(b) to permit WSRC to use the weighting factors in International Commission of Radiological Protection (ICRP) Publication 60 in determining radiation dose from intakes of radioactive materials.

Under the terms set forth in 10 CFR 820.61 and the National Defense Authorization Act for 2000 (Public Law 106-65) as amended, the Assistant Secretary for Environment, Safety and Health (EH-1) and the Deputy Administrator for Defense Programs (NA-10) are the Secretarial Officers granted the review and approval authority for exemption requests made with respect to 10 CFR 835 at sites where both the National Nuclear Security Administration (NNSA) and other Department of Energy (DOE) elements have line authority for radiological operations.

Based on a review of the supporting documentation, EH-1 and NA-10 find that the request set forth above has been justified for relief. Specifically, EH-1 and NA-10 find that the exemption criteria of 10 CFR 820.62 have been met. The requested exemption is not prohibited by law; will not present an undue risk to the public health and safety, the environment, or facility workers; and is consistent with the safe operation of a DOE nuclear facility. Also, EH-1 and NA-10 have determined that the exemption meets the special circumstance, 10 CFR 820.62(d)(4), described in the Technical Review prepared by the Office of Worker Protection Policy and Programs (EH-52), which constitutes a sufficient basis upon which to grant this exemption.

On the basis of the foregoing, EH-1 and NA-10 hereby approve the WSRC request for exemption from 10 CFR 835.2(b) and 203(b), with the following conditions:

1. WSRC revise its Radiation Protection Program (RPP) to require the use of ICRP Publication 60 tissue and organ weighting factors in the calculation of committed effective dose equivalent. Revise the definition of "weighting factor" in 10 CFR 835 as follows:

Weighting factor means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue. The dose equivalent to tissue is multiplied by the appropriate weighting factor to obtain the effective dose equivalent contribution from that tissue. The weighting factors are as follows:

WEIGHTING FACTORS FOR VARIOUS ORGANS AND TISSUES^{1,4}

| Tissue or Organ | Tissue Weighting Factor |
|------------------------|--------------------------------|
| Gonads | 0.20 |
| Bone Marrow (red) | 0.12 |
| Colon | 0.12 |
| Lung | 0.12 |
| Stomach | 0.12 |
| Bladder | 0.05 |
| Breast | 0.05 |
| Liver | 0.05 |
| Oesophagus | 0.05 |
| Thyroid | 0.01 |
| Skin | 0.01 |
| Bone Surface | 0.01 |
| Remainder | 0.05 ^{2,3} |

¹The values have been developed from a reference population of equal numbers of both sexes and a wide range of ages. In the definition of effective dose, they apply to workers, to the whole population, and to either sex.

²For purposes of calculation, the remainder is composed of the following additional tissues and organs: adrenals, brain, upper large intestine, small intestine, kidney, muscle, pancreas, spleen, thymus, and uterus. The list includes organs that are likely to be selectively irradiated. Some organs in the list are known to be susceptible to cancer induction. If other tissues and organs subsequently become identified as having a significant risk of induced cancer, they will then be included either with a specific weighting factor or in this additional list constituting the remainder. The latter may also include other tissues or organs selectively irradiated.

³In those exceptional cases in which a single one of the remainder tissues or organs receives an equivalent dose in excess of the highest dose in any of the 12 organs for which a weighting factor is specified, a weighting factor of 0.025 should be applied to that tissue or organ and a weighting factor of 0.025 to the average dose in the rest of the remainder as defined above.

⁴For the case of uniform external irradiation of the whole body, a weighting factor equal to 1 may be used in determination of the effective dose equivalent.

2. WSRC revise its RPP to reflect that compliance with 10 CFR 835.203(b) will be achieved by adherence to the definition of “weighting factor” provided in its RPP.
3. WSRC revise its RPP to reflect that the derived air concentration values and footnotes in Table 1 of the Technical Review accompanying this Exemption Decision will be used in lieu of those in 10 CFR 835 Appendix A in those provisions of 10 CFR 835 requiring the use of Appendix A values.
4. WSRC revise its RPP to reflect that the values and footnotes for establishing sealed source accountability and radioactive material posting and labeling requirements in Table 2 of the Technical Review accompanying this Exemption Decision will be used in lieu of those in 10 CFR 825 Appendix E in those provisions of 10 CFR 835 requiring the use of Appendix E values.

5. WSRC shall either implement this Exemption Decision such that it applies to all internal doses resulting from intakes that are received in the year 2005, or delay implementation so that it will begin applying for all internal doses resulting from intakes that are received in the year 2006. The term "year" is used as defined in 10 CFR 835.2(a).

Pursuant to 10 CFR 820.66, WSRC has 15 days from the date of the filing of this decision to file a Request to Review with the Office of Environment, Safety and Health. The Request to Review shall state, specifically, the respects in which the exemption determination is claimed to be erroneous, the grounds of the request, and the relief requested. If no Request to Review is submitted, the Exemption Decision becomes a final order 15 days after it is filed.

6/13/05
Date

JHS
John Spitaleri Shaw
Assistant Secretary for
Environment, Safety and Health

6/21/05
Date

TPDPL
Thomas P. D'Agostino
Acting Deputy Administrator for
Defense Programs
National Nuclear Safety Administration

Table 1: Derived Air Concentration (DAC) Values – International Commission of Radiological Protection (ICRP) Publication 60 Tissue and Organ Weighting Factors

The Department of Energy used ICRP “Database of Dose Coefficients: Workers and Members of the Public; Version 2.0.1” (ICRP 68 Database) in development of these values. Results from this program are essentially the same as the ICRP advice given in ICRP Publication 60 and ICRP Publication 68, “Dose Coefficients for Intakes of Radionuclides by Workers.” Consistent with the methodology used in developing the DACs in title 10, Code of Federal Regulations, part 835 (10 CFR 835), an evaluation was made for each DAC. DACs were evaluated as being controlled by the more limiting of either the stochastic (effective dose) limit of 0.05 sievert or the nonstochastic (tissue) limit of 0.5 sievert. Also similar to 10 CFR 835, an intake of 2,400 m³ in a year was assumed in calculating the DAC values. DACs were developed in units of both Bq·m⁻³ and µCi·cm⁻³ and then truncated to one significant figure.

The methodology in the ICRP 68 Database differs from that used in 10 CFR 835 methodology in the use of material types; F (fast), M (moderate), and S (slow) (in lieu of material classes; D (day), W (week), and Y (year)). An additional difference is that the following DACs, based on the ICRP 68 Database, are based on a particle size distribution of 5 µm, contrary to 10 CFR 835 DACs being based on 1 µm. For situations where the particle size distribution is known to differ significantly from 5 µm, appropriate corrections may be made to both the estimated dose to workers and DACs.

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--|----------------------------|--------|--------|----------------------------|--------|--------|--|--|
| | µCi/ml | | | Bq/m ³ | | | | |
| | F | M | S | F | M | S | | |
| H-3 (Water) ² | 2.E-05 | 2.E-05 | 2.E-05 | 7.E+05 | 7.E+05 | 7.E+05 | St/St/St | |
| H-3 (Elemental) ² | 2.E-01 | 2.E-01 | 2.E-01 | 9.E+09 | 9.E+09 | 9.E+09 | St/St/St | |
| Tritiated Particulate Aerosol and Organically Bound H-3 (Insoluble) ⁴ | 1.E-05 | 6.E-06 | 2.E-06 | 3.E+05 | 2.E+05 | 8.E+04 | St/St/St | |
| Organically Bound H-3 (Soluble) | 1.E-05 | 1.E-05 | 1.E-05 | 5.E+05 | 5.E+05 | 5.E+05 | St/St/St | |
| Be-7 | - | 1.E-05 | 1.E-05 | - | 4.E+05 | 4.E+05 | /St/St | |
| Be-10 | - | 8.E-08 | 2.E-08 | - | 3.E+03 | 1.E+03 | /St/St | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------------------------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| C-11 (Vapor) ² | - | 1.E-04 | - | - | 6.E+06 | - | /St/ | |
| C-11 (CO) ² | 4.E-04 | 4.E-04 | 4.E-04 | 1.E+07 | 1.E+07 | 1.E+07 | St/St/St | |
| C-11 (CO ₂) ² | 2.E-04 | 2.E-04 | 2.E-04 | 9.E+06 | 9.E+06 | 9.E+06 | St/St/St | |
| C-14 (Vapor) ² | - | 9.E-07 | - | - | 3.E+04 | - | /St/ | |
| C-14 (CO) ² | 7.E-04 | 7.E-04 | 7.E-04 | 2.E+07 | 2.E+07 | 2.E+07 | St/St/St | |
| C-14 (CO ₂) ² | 8.E-05 | 8.E-05 | 8.E-05 | 3.E+06 | 3.E+06 | 3.E+06 | St/St/St | |
| F-18 | 4.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Na-22 | 2.E-07 | - | - | 1.E+04 | - | - | E/ / | |
| Na-24 | 4.E-07 | - | - | 1.E+04 | - | - | ET/ / | |
| Mg-28 | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/St/ | |
| Al-26 | 4.E-08 | 4.E-08 | - | 1.E+03 | 1.E+03 | - | St/St/ | |
| Si-31 | 9.E-06 | 5.E-06 | 5.E-06 | 3.E+05 | 1.E+05 | 1.E+05 | ET/St/St | |
| Si-32 | 1.E-07 | 5.E-08 | 1.E-08 | 5.E+03 | 2.E+03 | 3.E+02 | St/St/St | |
| P-32 | 5.E-07 | 1.E-07 | - | 1.E+04 | 7.E+03 | - | St/St/ | |
| P-33 | 4.E-06 | 4.E-07 | - | 1.E+05 | 1.E+04 | - | St/St/ | |
| S-35 (Vapor) | - | 4.E-06 | - | - | 1.E+05 | - | /St/ | |
| S-35 | 7.E-06 | 5.E-07 | - | 2.E+05 | 1.E+04 | - | St/St/ | |
| Cl-36 | 1.E-06 | 1.E-07 | - | 4.E+04 | 4.E+03 | - | St/St/ | |
| Cl-38 | 7.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Cl-39 | 2.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| K-40 | 1.E-07 | - | - | 6.E+03 | - | - | St/ / | |
| K-42 | 2.E-06 | - | - | 1.E+05 | - | - | E/ / | |
| K-43 | 9.E-07 | - | - | 3.E+04 | - | - | ET/ / | |
| K-44 | 8.E-06 | - | - | 2.E+05 | - | - | ET/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| K-45 | 9.E-06 | - | - | 3.E+05 | - | - | ET/ / | |
| Ca-41 | - | 2.E-06 | - | - | 8.E+04 | - | /BS/ | |
| Ca-45 | - | 2.E-07 | - | - | 9.E+03 | - | /St/ | |
| Ca-47 | - | 2.E-07 | - | - | 9.E+03 | - | /St/ | |
| Sc-43 | - | - | 2.E-06 | - | - | 7.E+04 | / /ET | |
| Sc-44m | - | - | 2.E-07 | - | - | 1.E+04 | / /St | |
| Sc-44 | - | - | 1.E-06 | - | - | 4.E+04 | / /ET | |
| Sc-46 | - | - | 1.E-07 | - | - | 4.E+03 | / /St | |
| Sc-47 | - | - | 7.E-07 | - | - | 2.E+04 | / /St | |
| Sc-48 | - | - | 2.E-07 | - | - | 1.E+04 | / /ET | |
| Sc-49 | - | - | 8.E-06 | - | - | 3.E+05 | / /ET | |
| Ti-44 | 7.E-09 | 2.E-08 | 9.E-09 | 2.E+02 | 7.E+02 | 3.E+02 | St/St/St | |
| Ti-45 | 3.E-06 | 2.E-06 | 2.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| V-47 | 8.E-06 | 6.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| V-48 | 2.E-07 | 2.E-07 | - | 9.E+03 | 7.E+03 | - | ET/St/ | |
| V-49 | 1.E-05 | 2.E-05 | - | 7.E+05 | 9.E+05 | - | BS/St/ | |
| Cr-48 | 2.E-06 | 2.E-06 | 2.E-06 | 8.E+04 | 8.E+04 | 8.E+04 | ET/ET/ET | |
| Cr-49 | 7.E-06 | 5.E-06 | 5.E-06 | 2.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |
| Cr-51 | 1.E-05 | 1.E-05 | 1.E-05 | 6.E+05 | 6.E+05 | 5.E+05 | St/St/St | |
| Mn-51 | 7.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Mn-52m | 7.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Mn-52 | 2.E-07 | 2.E-07 | - | 8.E+03 | 8.E+03 | - | ET/ET/ | |
| Mn-53 | 5.E-06 | 1.E-05 | - | 2.E+05 | 5.E+05 | - | BS/St/ | |
| Mn-54 | 5.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | - | St/St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|------------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Mn-56 | 2.E-06 | 2.E-06 | - | 9.E+04 | 8.E+04 | - | ET/ET/ | |
| Fe-52 | 6.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | - | ET/E/ | |
| Fe-55 | 6.E-07 | 1.E-06 | - | 2.E+04 | 6.E+04 | - | St/St/ | |
| Fe-59 | 1.E-07 | 1.E-07 | - | 6.E+03 | 6.E+03 | - | St/St/ | |
| Fe-60 | 1.E-09 | 4.E-09 | - | 6.E+01 | 1.E+02 | - | St/St/ | |
| Co-55 | - | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | /ET/ET | |
| Co-56 | - | 1.E-07 | 1.E-07 | - | 5.E+03 | 4.E+03 | /St/St | |
| Co-57 | - | 1.E-06 | 9.E-07 | - | 5.E+04 | 3.E+04 | /St/St | |
| Co-58m | - | 3.E-05 | 3.E-05 | - | 1.E+06 | 1.E+06 | /St/St | |
| Co-58 | - | 4.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Co-60m | - | 4.E-04 | 4.E-04 | - | 1.E+07 | 1.E+07 | /St/St | |
| Co-60 | - | 7.E-08 | 3.E-08 | - | 2.E+03 | 1.E+03 | /St/St | |
| Co-61 | - | 6.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Co-62m | - | 7.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Ni-56 (Inorg) | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | - | ET/ET/ | |
| Ni-56 (Carbonyl) | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| Ni-57 (Inorg) | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |
| Ni-57 (Carbonyl) | - | 7.E-07 | - | - | 2.E+04 | - | /ET/ | |
| Ni-59 (Inorg) | 2.E-06 | 5.E-06 | - | 9.E+04 | 2.E+05 | - | St/St/ | |
| Ni-59 (Carbonyl) | - | 6.E-07 | - | - | 2.E+04 | - | /St/ | |
| Ni-63 (Inorg) | 1.E-06 | 1.E-06 | - | 4.E+04 | 6.E+04 | - | St/St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|---------------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ni-63 (Carbonyl) | - | 2.E-07 | - | - | 1.E+04 | - | /St/ | |
| Ni-65 (Inorg) | 5.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Ni-65 (Carbonyl) | - | 8.E-07 | - | - | 3.E+04 | - | /ET/ | |
| Ni-66 (Inorg) | 7.E-07 | 2.E-07 | - | 2.E+04 | 1.E+04 | - | St/St/ | |
| Ni-66 (Carbonyl) | - | 2.E-07 | - | - | 1.E+04 | - | /ET/ | |
| Cu-60 | 5.E-06 | 4.E-06 | 4.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Cu-61 | 3.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Cu-64 | 4.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/E/E | |
| Cu-67 | 2.E-06 | 1.E-06 | 9.E-07 | 8.E+04 | 3.E+04 | 3.E+04 | ET/St/St | |
| Zn-62 | - | - | 8.E-07 | - | - | 3.E+04 | / /St | |
| Zn-63 | - | - | 5.E-06 | - | - | 2.E+05 | / /ET | |
| Zn-65 | - | - | 2.E-07 | - | - | 7.E+03 | / /St | |
| Zn-69m | - | - | 1.E-06 | - | - | 6.E+04 | / /St | |
| Zn-69 | - | - | 7.E-06 | - | - | 2.E+05 | / /ET | |
| Zn-71m | - | - | 1.E-06 | - | - | 5.E+04 | / /ET | |
| Zn-72 | - | - | 3.E-07 | - | - | 1.E+04 | / /St | |
| Ga-65 | 1.E-05 | 9.E-06 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| Ga-66 | 8.E-07 | 7.E-07 | - | 3.E+04 | 2.E+04 | - | ET/St/ | |
| Ga-67 | 3.E-06 | 2.E-06 | - | 1.E+05 | 7.E+04 | - | ET/St/ | |
| Ga-68 | 6.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| Ga-70 | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Ga-72 | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ga-73 | 4.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/St/ | |
| Ge-66 | 2.E-06 | 2.E-06 | - | 9.E+04 | 9.E+04 | - | ET/ET/ | |
| Ge-67 | 1.E-05 | 7.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Ge-68 | 6.E-07 | 7.E-08 | - | 2.E+04 | 2.E+03 | - | ET/St/ | |
| Ge-69 | 1.E-06 | 1.E-06 | - | 3.E+04 | 3.E+04 | - | ET/ET/ | |
| Ge-71 | 5.E-05 | 5.E-05 | - | 2.E+06 | 1.E+06 | - | ET/E/ | |
| Ge-75 | 1.E-05 | 7.E-06 | - | 4.E+05 | 2.E+05 | - | ET/ET/ | |
| Ge-77 | 1.E-06 | 1.E-06 | - | 4.E+04 | 4.E+04 | - | ET/ET/ | |
| Ge-78 | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| As-69 | - | 9.E-06 | - | - | 3.E+05 | - | /ET/ | |
| As-70 | - | 2.E-06 | - | - | 8.E+04 | - | /ET/ | |
| As-71 | - | 1.E-06 | - | - | 4.E+04 | - | /St/ | |
| As-72 | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| As-73 | - | 8.E-07 | - | - | 3.E+04 | - | /St/ | |
| As-74 | - | 3.E-07 | - | - | 1.E+04 | - | /St/ | |
| As-76 | - | 6.E-07 | - | - | 2.E+04 | - | /St/ | |
| As-77 | - | 1.E-06 | - | - | 4.E+04 | - | /St/ | |
| As-78 | - | 3.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Se-70 | 2.E-06 | 2.E-06 | - | 1.E+05 | 9.E+04 | - | ET/ET/ | |
| Se-73m | 1.E-05 | 1.E-05 | - | 5.E+05 | 4.E+05 | - | ET/ET/ | |
| Se-73 | 1.E-06 | 1.E-06 | - | 6.E+04 | 5.E+04 | - | ET/ET/ | |
| Se-75 | 4.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | St/St/ | |
| Se-79 | 3.E-07 | 1.E-07 | - | 1.E+04 | 6.E+03 | - | K/St/ | |
| Se-81m | 1.E-05 | 6.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Se-81 | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Se-83 | 6.E-06 | 5.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| Br-74m | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Br-74 | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Br-75 | 4.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Br-76 | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |
| Br-77 | 2.E-06 | 2.E-06 | - | 7.E+04 | 7.E+04 | - | ET/ET/ | |
| Br-80m | 6.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/St/ | |
| Br-80 | 3.E-05 | 2.E-05 | - | 1.E+06 | 7.E+05 | - | ET/ET/ | |
| Br-82 | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/ET/ | |
| Br-83 | 9.E-06 | 6.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Br-84 | 7.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Rb-79 | 8.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Rb-81m | 1.E-05 | - | - | 6.E+05 | - | - | ET/ / | |
| Rb-81 | 2.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Rb-82m | 8.E-07 | - | - | 3.E+04 | - | - | ET/ / | |
| Rb-83 | 5.E-07 | - | - | 2.E+04 | - | - | St/ / | |
| Rb-84 | 3.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Rb-86 | 4.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Rb-87 | 7.E-07 | - | - | 2.E+04 | - | - | St/ / | |
| Rb-88 | 1.E-05 | - | - | 5.E+05 | - | - | ET/ / | |
| Rb-89 | 1.E-05 | - | - | 3.E+05 | - | - | ET/ / | |
| Sr-80 | 3.E-06 | - | 2.E-06 | 1.E+05 | - | 9.E+04 | ET/ /St | |
| Sr-81 | 7.E-06 | - | 5.E-06 | 2.E+05 | - | 2.E+05 | ET/ /ET | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Sr-82 | 1.E-07 | - | 7.E-08 | 6.E+03 | - | 2.E+03 | St/ /St | |
| Sr-83 | 1.E-06 | - | 9.E-07 | 3.E+04 | - | 3.E+04 | ET/ /ET | |
| Sr-85m | 4.E-05 | - | 3.E-05 | 1.E+06 | - | 1.E+06 | ET/ /ET | |
| Sr-85 | 1.E-06 | - | 8.E-07 | 3.E+04 | - | 3.E+04 | St/ /St | |
| Sr-87m | 1.E-05 | - | 9.E-06 | 4.E+05 | - | 3.E+05 | ET/ /ET | |
| Sr-89 | 4.E-07 | - | 1.E-07 | 1.E+04 | - | 3.E+03 | St/ /St | |
| Sr-90 | 1.E-08 | - | 7.E-09 | 4.E+02 | - | 2.E+02 | BS/ /St | |
| Sr-91 | 1.E-06 | - | 9.E-07 | 5.E+04 | - | 3.E+04 | ET/ /St | |
| Sr-92 | 2.E-06 | - | 1.E-06 | 8.E+04 | - | 6.E+04 | ET/ /St | |
| Y-86m | - | 7.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Y-86 | - | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | /ET/ET | |
| Y-87 | - | 9.E-07 | 8.E-07 | - | 3.E+04 | 3.E+04 | /ET/ET | |
| Y-88 | - | 1.E-07 | 1.E-07 | - | 6.E+03 | 6.E+03 | /St/St | |
| Y-90m | - | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | /St/St | |
| Y-90 | - | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Y-91m | - | 2.E-05 | 2.E-05 | - | 7.E+05 | 7.E+05 | /ET/ET | |
| Y-91 | - | 1.E-07 | 9.E-08 | - | 4.E+03 | 3.E+03 | /St/St | |
| Y-92 | - | 2.E-06 | 2.E-06 | - | 7.E+04 | 7.E+04 | /St/St | |
| Y-93 | - | 9.E-07 | 9.E-07 | - | 3.E+04 | 3.E+04 | /St/St | |
| Y-94 | - | 8.E-06 | 8.E-06 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Y-95 | - | 1.E-05 | 1.E-05 | - | 4.E+05 | 4.E+05 | /ET/ET | |
| Zr-86 | 5.E-07 | 5.E-07 | 5.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | ET/ET/ET | |
| Zr-88 | 1.E-07 | 3.E-07 | 3.E-07 | 5.E+03 | 1.E+04 | 1.E+04 | St/St/St | |
| Zr-89 | 6.E-07 | 6.E-07 | 6.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | ET/ET/ET | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------|----------------------------|--------|--------|----------------------------|--------|--------|--|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Zr-93 | 3.E-09 | 1.E-08 | 1.E-07 | 1.E+02 | 6.E+02 | 5.E+03 | BS/BS/BS | |
| Zr-95 | 9.E-08 | 1.E-07 | 1.E-07 | 3.E+03 | 5.E+03 | 4.E+03 | BS/St/St | |
| Zr-97 | 7.E-07 | 4.E-07 | 4.E-07 | 2.E+04 | 1.E+04 | 1.E+04 | ET/St/St | |
| Nb-88 | - | 5.E-06 | 5.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nb-89 (66 min) | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nb-89 (122 min) | - | 2.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nb-90 | - | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | /ET/ET | |
| Nb-93m | - | 1.E-06 | 6.E-07 | - | 7.E+04 | 2.E+04 | /St/St | |
| Nb-94 | - | 7.E-08 | 2.E-08 | - | 2.E+03 | 8.E+02 | /St/St | |
| Nb-95m | - | 7.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Nb-95 | - | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Nb-96 | - | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | /ET/ET | |
| Nb-97 | - | 5.E-06 | 5.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nb-98 | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Mo-90 | 8.E-07 | - | 7.E-07 | 3.E+04 | - | 2.E+04 | ET/ /ET | |
| Mo-93m | 1.E-06 | - | 1.E-06 | 3.E+04 | - | 3.E+04 | ET/ /ET | |
| Mo-93 | 2.E-07 | - | 4.E-07 | 7.E+03 | - | 1.E+04 | BS/ /St | |
| Mo-99 | 1.E-06 | - | 5.E-07 | 5.E+04 | - | 1.E+04 | E/ /St | |
| Mo-101 | 8.E-06 | - | 6.E-06 | 3.E+05 | - | 2.E+05 | ET/ /ET | |
| Tc-93m | 8.E-06 | 7.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Tc-93 | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Tc-94m | 5.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Tc-94 | 1.E-06 | 1.E-06 | - | 4.E+04 | 3.E+04 | - | ET/ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Tc-95m | 8.E-07 | 6.E-07 | - | 3.E+04 | 2.E+04 | - | ET/St/ | |
| Tc-95 | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | - | ET/ET/ | |
| Tc-96m | 2.E-05 | 2.E-05 | - | 1.E+06 | 1.E+06 | - | ET/ET/ | |
| Tc-96 | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/ET/ | |
| Tc-97m | 1.E-06 | 2.E-07 | - | 5.E+04 | 7.E+03 | - | St/St/ | |
| Tc-97 | 4.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/St/ | |
| Tc-98 | 3.E-07 | 9.E-08 | - | 1.E+04 | 3.E+03 | - | St/St/ | |
| Tc-99m | 1.E-05 | 1.E-05 | - | 5.E+05 | 4.E+05 | - | ET/ET/ | |
| Tc-99 | 1.E-06 | 1.E-07 | - | 5.E+04 | 6.E+03 | - | St/St/ | |
| Tc-101 | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Tc-104 | 9.E-06 | 7.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Ru-94 | 5.E-06 | 5.E-06 | 5.E-06 | 2.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Ru-97 | 2.E-06 | 2.E-06 | 2.E-06 | 8.E+04 | 8.E+04 | 8.E+04 | ET/ET/ET | |
| Ru-103 | 8.E-07 | 2.E-07 | 2.E-07 | 3.E+04 | 1.E+04 | 9.E+03 | St/St/St | |
| Ru-105 | 2.E-06 | 2.E-06 | 2.E-06 | 9.E+04 | 8.E+04 | 8.E+04 | ET/ET/ET | |
| Ru-106 | 5.E-08 | 3.E-08 | 1.E-08 | 2.E+03 | 1.E+03 | 5.E+02 | St/St/St | |
| Rh-99m | 3.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Rh-99 | 8.E-07 | 6.E-07 | 6.E-07 | 3.E+04 | 2.E+04 | 2.E+04 | ET/St/St | |
| Rh-100 | 5.E-07 | 5.E-07 | 5.E-07 | 1.E+04 | 1.E+04 | 1.E+04 | ET/ET/ET | |
| Rh-101m | 1.E-06 | 1.E-06 | 1.E-06 | 6.E+04 | 6.E+04 | 6.E+04 | ET/ET/ET | |
| Rh-101 | 3.E-07 | 3.E-07 | 1.E-07 | 1.E+04 | 1.E+04 | 6.E+03 | St/St/St | |
| Rh-102m | 2.E-07 | 2.E-07 | 1.E-07 | 1.E+04 | 7.E+03 | 4.E+03 | St/St/St | |
| Rh-102 | 6.E-08 | 1.E-07 | 6.E-08 | 2.E+03 | 4.E+03 | 2.E+03 | St/St/St | |
| Rh-103m | 4.E-04 | 2.E-04 | 2.E-04 | 1.E+07 | 8.E+06 | 8.E+06 | St/St/St | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|--|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Rh-105 | 3.E-06 | 1.E-06 | 1.E-06 | 1.E+05 | 5.E+04 | 4.E+04 | ET/St/St | |
| Rh-106m | 1.E-06 | 1.E-06 | 1.E-06 | 6.E+04 | 5.E+04 | 5.E+04 | ET/ET/ET | |
| Rh-107 | 1.E-05 | 9.E-06 | 9.E-06 | 5.E+05 | 3.E+05 | 3.E+05 | ET/ET/ET | |
| Pd-100 | 5.E-07 | 5.E-07 | 5.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | ET/ET/ET | |
| Pd-101 | 3.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Pd-103 | 4.E-06 | 1.E-06 | 1.E-06 | 1.E+05 | 6.E+04 | 7.E+04 | E/St/St | |
| Pd-107 | 1.E-05 | 1.E-05 | 1.E-06 | 5.E+05 | 4.E+05 | 7.E+04 | K/St/St | |
| Pd-109 | 2.E-06 | 1.E-06 | 1.E-06 | 9.E+04 | 4.E+04 | 4.E+04 | St/St/St | |
| Ag-102 | 9.E-06 | 7.E-06 | 7.E-06 | 3.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |
| Ag-103 | 8.E-06 | 7.E-06 | 7.E-06 | 3.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |
| Ag-104m | 8.E-06 | 6.E-06 | 6.E-06 | 2.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |
| Ag-104 | 3.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Ag-105 | 7.E-07 | 8.E-07 | 7.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | St/St/St | |
| Ag-106m | 2.E-07 | 2.E-07 | 2.E-07 | 9.E+03 | 9.E+03 | 9.E+03 | ET/ET/ET | |
| Ag-106 | 1.E-05 | 1.E-05 | 1.E-05 | 5.E+05 | 4.E+05 | 4.E+05 | ET/ET/ET | |
| Ag-108m | 7.E-08 | 1.E-07 | 2.E-08 | 2.E+03 | 4.E+03 | 1.E+03 | St/St/St | |
| Ag-110m | 8.E-08 | 9.E-08 | 7.E-08 | 3.E+03 | 3.E+03 | 2.E+03 | St/St/St | |
| Ag-111 | 9.E-07 | 3.E-07 | 3.E-07 | 3.E+04 | 1.E+04 | 1.E+04 | St/St/St | |
| Ag-112 | 4.E-06 | 2.E-06 | 2.E-06 | 1.E+05 | 8.E+04 | 8.E+04 | E/St/St | |
| Ag-115 | 1.E-05 | 8.E-06 | 8.E-06 | 4.E+05 | 3.E+05 | 3.E+05 | ET/ET/ET | |
| Cd-104 | 4.E-06 | 4.E-06 | 4.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Cd-107 | 5.E-06 | 5.E-06 | 4.E-06 | 2.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Cd-109 | 2.E-08 | 9.E-08 | 1.E-07 | 9.E+02 | 3.E+03 | 4.E+03 | K/K/St | |
| Cd-113m | 1.E-09 | 6.E-09 | 1.E-08 | 6.E+01 | 2.E+02 | 6.E+02 | K/K/K | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Cd-113 | 1.E-09 | 5.E-09 | 1.E-08 | 5.E+01 | 2.E+02 | 5.E+02 | K/K/K | |
| Cd-115m | 3.E-08 | 1.E-07 | 1.E-07 | 1.E+03 | 3.E+03 | 3.E+03 | K/St/St | |
| Cd-115 | 9.E-07 | 4.E-07 | 4.E-07 | 3.E+04 | 1.E+04 | 1.E+04 | K/St/St | |
| Cd-117m | 1.E-06 | 1.E-06 | 1.E-06 | 4.E+04 | 4.E+04 | 4.E+04 | ET/ET/ET | |
| Cd-117 | 2.E-06 | 2.E-06 | 2.E-06 | 8.E+04 | 7.E+04 | 7.E+04 | ET/ET/ET | |
| In-109 | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| In-110 (69 min) | 5.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| In-110 (5 h) | 9.E-07 | 9.E-07 | - | 3.E+04 | 3.E+04 | - | ET/ET/ | |
| In-111 | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | - | ET/ET/ | |
| In-112 | 2.E-05 | 1.E-05 | - | 9.E+05 | 6.E+05 | - | ET/ET/ | |
| In-113m | 1.E-05 | 1.E-05 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| In-114m | 5.E-08 | 9.E-08 | - | 1.E+03 | 3.E+03 | - | St/St/ | |
| In-115m | 6.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| In-115 | 1.E-09 | 5.E-09 | - | 4.E+01 | 1.E+02 | - | St/St/ | |
| In-116m | 4.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| In-117m | 5.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| In-117 | 7.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| In-119m | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Sn-110 | 1.E-06 | 1.E-06 | - | 6.E+04 | 6.E+04 | - | ET/ET/ | |
| Sn-111 | 1.E-05 | 1.E-05 | - | 6.E+05 | 5.E+05 | - | ET/ET/ | |
| Sn-113 | 7.E-07 | 2.E-07 | - | 2.E+04 | 1.E+04 | - | St/St/ | |
| Sn-117m | 8.E-07 | 2.E-07 | - | 3.E+04 | 9.E+03 | - | BS/St/ | |
| Sn-119m | 1.E-06 | 3.E-07 | - | 5.E+04 | 1.E+04 | - | St/St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Sn-121m | 5.E-07 | 1.E-07 | - | 2.E+04 | 6.E+03 | - | St/St/ | |
| Sn-121 | 4.E-06 | 2.E-06 | - | 1.E+05 | 7.E+04 | - | ET/St/ | |
| Sn-123m | 1.E-05 | 7.E-06 | - | 4.E+05 | 2.E+05 | - | ET/ET/ | |
| Sn-123 | 3.E-07 | 1.E-07 | - | 1.E+04 | 3.E+03 | - | St/St/ | |
| Sn-125 | 4.E-07 | 2.E-07 | - | 1.E+04 | 7.E+03 | - | St/St/ | |
| Sn-126 | 4.E-08 | 3.E-08 | - | 1.E+03 | 1.E+03 | - | St/St/ | |
| Sn-127 | 2.E-06 | 2.E-06 | - | 9.E+04 | 7.E+04 | - | ET/ET/ | |
| Sn-128 | 2.E-06 | 2.E-06 | - | 1.E+05 | 8.E+04 | - | ET/ET/ | |
| Sb-115 | 1.E-05 | 1.E-05 | - | 5.E+05 | 4.E+05 | - | ET/ET/ | |
| Sb-116m | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Sb-116 | 1.E-05 | 1.E-05 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| Sb-117 | 1.E-05 | 1.E-05 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| Sb-118m | 1.E-06 | 1.E-06 | - | 4.E+04 | 4.E+04 | - | ET/ET/ | |
| Sb-119 | 6.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Sb-120 (16 min) | 2.E-05 | 2.E-05 | - | 1.E+06 | 7.E+05 | - | ET/ET/ | |
| Sb-120 (6 d) | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/ET/ | |
| Sb-122 | 8.E-07 | 4.E-07 | - | 3.E+04 | 1.E+04 | - | St/St/ | |
| Sb-124m | 4.E-05 | 3.E-05 | - | 1.E+06 | 1.E+06 | - | ET/ET/ | |
| Sb-124 | 2.E-07 | 1.E-07 | - | 1.E+04 | 4.E+03 | - | St/St/ | |
| Sb-125 | 2.E-07 | 1.E-07 | - | 7.E+03 | 6.E+03 | - | BS/St/ | |
| Sb-126m | 1.E-05 | 7.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Sb-126 | 2.E-07 | 1.E-07 | - | 9.E+03 | 6.E+03 | - | ET/St/ | |
| Sb-127 | 7.E-07 | 3.E-07 | - | 2.E+04 | 1.E+04 | - | E/St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Sb-128 (9 h) | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |
| Sb-128 (10 min) | 1.E-05 | 9.E-06 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| Sb-129 | 1.E-06 | 1.E-06 | - | 6.E+04 | 5.E+04 | - | ET/ET/ | |
| Sb-130 | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Sb-131 | 6.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| Te-116 (Vapor) | - | 6.E-06 | - | - | 2.E+05 | - | /St / | |
| Te-116 | 2.E-06 | 2.E-06 | - | 8.E+04 | 7.E+04 | - | ET/ET/ | |
| Te-121m (Vapor) | - | 4.E-08 | - | - | 1.E+03 | - | /BS/ | |
| Te-121m | 1.E-07 | 1.E-07 | - | 4.E+03 | 5.E+03 | - | BS/St/ | |
| Te-121 (Vapor) | - | 1.E-06 | - | - | 4.E+04 | - | /St / | |
| Te-121 | 1.E-06 | 1.E-06 | - | 3.E+04 | 3.E+04 | - | ET/ET/ | |
| Te-123m (Vapor) | - | 5.E-08 | - | - | 2.E+03 | - | /BS/ | |
| Te-123m | 1.E-07 | 1.E-07 | - | 4.E+03 | 6.E+03 | - | BS/St/ | |
| Te-123 (Vapor) | - | 1.E-08 | - | - | 4.E+02 | - | /BS/ | |
| Te-123 | 2.E-08 | 5.E-08 | - | 1.E+03 | 1.E+03 | - | BS/BS/ | |
| Te-125m (Vapor) | - | 1.E-07 | - | - | 3.E+03 | - | /BS/ | |
| Te-125m | 2.E-07 | 1.E-07 | - | 9.E+03 | 7.E+03 | - | BS/St/ | |
| Te-127m (Vapor) | - | 6.E-08 | - | - | 2.E+03 | - | /BS/ | |
| Te-127m | 1.E-07 | 9.E-08 | - | 5.E+03 | 3.E+03 | - | BS/St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Te-127 (Vapor) | - | 7.E-06 | - | - | 2.E+05 | - | /St/ | |
| Te-127 | 5.E-06 | 3.E-06 | - | 2.E+05 | 1.E+05 | - | ET/St/ | |
| Te-129m (Vapor) | - | 1.E-07 | - | - | 5.E+03 | - | /St/ | |
| Te-129m | 3.E-07 | 1.E-07 | - | 1.E+04 | 3.E+03 | - | St/St/ | |
| Te-129 (Vapor) | - | 1.E-05 | - | - | 5.E+05 | - | /St/ | |
| Te-129 | 1.E-05 | 7.E-06 | - | 4.E+05 | 2.E+05 | - | ET/ET/ | |
| Te-131m (Vapor) | - | 1.E-07 | - | - | 5.E+03 | - | /T/ | |
| Te-131m | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | T/St/ | |
| Te-131 (Vapor) | - | 6.E-06 | - | - | 2.E+05 | - | /T/ | |
| Te-131 | 1.E-05 | 7.E-06 | - | 4.E+05 | 2.E+05 | - | ET/ET/ | |
| Te-132 (Vapor) | - | 7.E-08 | - | - | 2.E+03 | - | /T/ | |
| Te-132 | 1.E-07 | 1.E-07 | - | 6.E+03 | 6.E+03 | - | T/St/ | |
| Te-133m (Vapor) | - | 1.E-06 | - | - | 6.E+04 | - | /T/ | |
| Te-133m | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | T/ET/ | |
| Te-133 (Vapor) | - | 7.E-06 | - | - | 2.E+05 | - | /T/ | |
| Te-133 | 1.E-05 | 9.E-06 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| Te-134 (Vapor) | - | 6.E-06 | - | - | 2.E+05 | - | /St/ | |
| Te-134 | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| I-120m (Methyl) | 4.E-06 | - | - | 1.E+05 | - | - | T/ / | |
| I-120m (Vapor) | - | 3.E-06 | - | - | 1.E+05 | - | /St / | |
| I-120m | 2.E-06 | - | - | 8.E+04 | - | - | ET/ / | |
| I-120 (Methyl) | 1.E-06 | - | - | 6.E+04 | - | - | T/ / | |
| I-120 (Vapor) | - | 1.E-06 | - | - | 5.E+04 | - | /T/ | |
| I-120 | 2.E-06 | - | - | 1.E+05 | - | - | E/ / | |
| I-121 (Methyl) | 5.E-06 | - | - | 2.E+05 | - | - | T/ / | |
| I-121 (Vapor) | - | 4.E-06 | - | - | 1.E+05 | - | /T/ | |
| I-121 | 8.E-06 | - | - | 3.E+05 | - | - | T/ / | |
| I-123 (Methyl) | 1.E-06 | - | - | 7.E+04 | - | - | T/ / | |
| I-123 (Vapor) | - | 1.E-06 | - | - | 5.E+04 | - | /T/ | |
| I-123 | 2.E-06 | - | - | 1.E+05 | - | - | T/ / | |
| I-124 (Methyl) | 3.E-08 | - | - | 1.E+03 | - | - | T/ / | |
| I-124 (Vapor) | - | 2.E-08 | - | - | 9.E+02 | - | /T/ | |
| I-124 | 4.E-08 | - | - | 1.E+03 | - | - | T/ / | |
| I-125 (Methyl) | 2.E-08 | - | - | 9.E+02 | - | - | T/ / | |
| I-125 (Vapor) | - | 2.E-08 | - | - | 7.E+02 | - | /T/ | |
| I-125 | 3.E-08 | - | - | 1.E+03 | - | - | T/ / | |
| I-126 (Methyl) | 1.E-08 | - | - | 5.E+02 | - | - | T/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| I-126 (Vapor) | - | 1.E-08 | - | - | 4.E+02 | - | /T/ | |
| I-126 | 2.E-08 | - | - | 7.E+02 | - | - | T/ / | |
| I-128 (Methyl) | 3.E-05 | - | - | 1.E+06 | - | - | T/ / | |
| I-128 (Vapor) | - | 8.E-06 | - | - | 3.E+05 | - | /St/ | |
| I-128 | 1.E-05 | - | - | 6.E+05 | - | - | ET/ / | |
| I-129 (Methyl) | 3.E-09 | - | - | 1.E+02 | - | - | T/ / | |
| I-129 (Vapor) | - | 2.E-09 | - | - | 1.E+02 | - | /T/ | |
| I-129 | 5.E-09 | - | - | 2.E+02 | - | - | T/ / | |
| I-130 (Methyl) | 2.E-07 | - | - | 7.E+03 | - | - | T/ / | |
| I-130 (Vapor) | - | 1.E-07 | - | - | 6.E+03 | - | /T/ | |
| I-130 | 3.E-07 | - | - | 1.E+04 | - | - | T/ / | |
| I-131 (Methyl) | 1.E-08 | - | - | 6.E+02 | - | - | T/ / | |
| I-131 (Vapor) | - | 1.E-08 | - | - | 5.E+02 | - | /T/ | |
| I-131 | 2.E-08 | - | - | 9.E+02 | - | - | T/ / | |
| I-132m (Methyl) | 1.E-06 | - | - | 7.E+04 | - | - | T/ / | |
| I-132m (Vapor) | - | 1.E-06 | - | - | 6.E+04 | - | /T/ | |
| I-132m | 3.E-06 | - | - | 1.E+05 | - | - | T/ / | |
| I-132 (Methyl) | 1.E-06 | - | - | 6.E+04 | - | - | T/ / | |
| I-132 (Vapor) | - | 1.E-06 | - | - | 5.E+04 | - | /T/ | |
| I-132 | 2.E-06 | - | - | 7.E+04 | - | - | T/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-------------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| I-133 (Methyl) | 9.E-08 | - | - | 3.E+03 | - | - | T/ / | |
| I-133 (Vapor) | - | 7.E-08 | - | - | 2.E+03 | - | /T/ | |
| I-133 | 1.E-07 | - | - | 5.E+03 | - | - | T/ / | |
| I-134 (Methyl) | 8.E-06 | - | - | 2.E+05 | - | - | T/ / | |
| I-134 (Vapor) | - | 3.E-06 | - | - | 1.E+05 | - | /St/ | |
| I-134 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| I-135 (Methyl) | 4.E-07 | - | - | 1.E+04 | - | - | T/ / | |
| I-135 (Vapor) | - | 3.E-07 | - | - | 1.E+04 | - | /T/ | |
| I-135 | 6.E-07 | - | - | 2.E+04 | - | - | T/ / | |
| Cs-125 | 1.E-05 | - | - | 4.E+05 | - | - | ET/ / | |
| Cs-127 | 4.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Cs-129 | 2.E-06 | - | - | 9.E+04 | - | - | ET/ / | |
| Cs-130 | 1.E-05 | - | - | 6.E+05 | - | - | ET/ / | |
| Cs-131 | 7.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Cs-132 | 9.E-07 | - | - | 3.E+04 | - | - | ET/ / | |
| Cs-134m | 8.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Cs-134 | 5.E-08 | - | - | 2.E+03 | - | - | St/ / | |
| Cs-135m | 8.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Cs-135 | 5.E-07 | - | - | 2.E+04 | - | - | St/ / | |
| Cs-136 | 2.E-07 | - | - | 1.E+04 | - | - | E/ / | |
| Cs-137 | 8.E-08 | - | - | 3.E+03 | - | - | St/ / | |
| Cs-138 | 5.E-06 | - | - | 2.E+05 | - | - | ET/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ba-126 | 4.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Ba-128 | 4.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Ba-131m | 4.E-05 | - | - | 1.E+06 | - | - | ET/ / | |
| Ba-131 | 1.E-06 | - | - | 4.E+04 | - | - | ET/ / | |
| Ba-133m | 2.E-06 | - | - | 7.E+04 | - | - | St/ / | |
| Ba-133 | 3.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Ba-135m | 2.E-06 | - | - | 9.E+04 | -- | - | St/ / | |
| Ba-139 | 1.E-05 | - | - | 3.E+05 | - | - | St/ / | |
| Ba-140 | 3.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Ba-141 | 1.E-05 | - | - | 4.E+05 | - | - | ET/ / | |
| Ba-142 | 9.E-06 | - | - | 3.E+05 | - | - | ET/ / | |
| La-131 | 1.E-05 | 8.E-06 | - | 4.E+05 | 3.E+05 | - | ET/ET/ | |
| La-132 | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | - | ET/ET/ | |
| La-135 | 1.E-05 | 1.E-05 | - | 4.E+05 | 4.E+05 | - | ET/ET/ | |
| La-137 | 4.E-08 | 2.E-07 | - | 1.E+03 | 8.E+03 | - | L/L/ | |
| La-138 | 3.E-09 | 1.E-08 | - | 1.E+02 | 4.E+02 | - | St/St/ | |
| La-140 | 4.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/St/ | |
| La-141 | 5.E-06 | 2.E-06 | - | 1.E+05 | 9.E+04 | - | St/St/ | |
| La-142 | 2.E-06 | 2.E-06 | - | 9.E+04 | 8.E+04 | - | ET/ET/ | |
| La-143 | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Ce-134 | - | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Ce-135 | - | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | /ET/ET | |
| Ce-137m | - | 1.E-06 | 9.E-07 | - | 3.E+04 | 3.E+04 | /St/St | |
| Ce-137 | - | 1.E-05 | 1.E-05 | - | 7.E+05 | 7.E+05 | /ET/ET | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ce-139 | - | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Ce-141 | - | 2.E-07 | 1.E-07 | - | 7.E+03 | 6.E+03 | /St/St | |
| Ce-143 | - | 5.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Ce-144 | - | 2.E-08 | 1.E-08 | - | 9.E+02 | 7.E+02 | /St/St | |
| Pr-136 | - | 1.E-05 | 1.E-05 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Pr-137 | - | 9.E-06 | 9.E-06 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Pr-138m | - | 2.E-06 | 2.E-06 | - | 7.E+04 | 7.E+04 | /ET/ET | |
| Pr-139 | - | 1.E-05 | 1.E-05 | - | 5.E+05 | 5.E+05 | /ET/ET | |
| Pr-142m | - | 6.E-05 | 5.E-05 | - | 2.E+06 | 2.E+06 | /St/St | |
| Pr-142 | - | 8.E-07 | 7.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Pr-143 | - | 2.E-07 | 2.E-07 | - | 1.E+04 | 9.E+03 | /St/St | |
| Pr-144 | - | 1.E-05 | 1.E-05 | - | 4.E+05 | 4.E+05 | /ET/ET | |
| Pr-145 | - | 2.E-06 | 2.E-06 | - | 8.E+04 | 8.E+04 | /St/St | |
| Pr-147 | - | 9.E-06 | 9.E-06 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Nd-136 | - | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nd-138 | - | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | /St/St | |
| Nd-139m | - | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | /ET/ET | |
| Nd-139 | - | 1.E-05 | 1.E-05 | - | 6.E+05 | 6.E+05 | /ET/ET | |
| Nd-141 | - | 3.E-05 | 3.E-05 | - | 1.E+06 | 1.E+06 | /ET/ET | |
| Nd-147 | - | 2.E-07 | 2.E-07 | - | 1.E+04 | 9.E+03 | /St/St | |
| Nd-149 | - | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Nd-151 | - | 9.E-06 | 9.E-06 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Pm-141 | - | 1.E-05 | 1E-05 | - | 4.E+05 | 4.E+05 | /ET/ET | |
| Pm-143 | - | 5.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Pm-144 | - | 1.E-07 | 1.E-07 | - | 3.E+03 | 5.E+03 | /St/St | |
| Pm-145 | - | 1.E-07 | 4.E-07 | - | 5.E+03 | 1.E+04 | /BS/St | |
| Pm-146 | - | 4.E-08 | 6.E-08 | - | 1.E+03 | 2.E+03 | /St/St | |
| Pm-147 | - | 1.E-07 | 1.E-07 | - | 4.E+03 | 6.E+03 | /BS/St | |
| Pm-148m | - | 1.E-07 | 1.E-07 | - | 5.E+03 | 4.E+03 | /St/St | |
| Pm-148 | - | 2.E-07 | 2.E-07 | - | 9.E+03 | 9.E+03 | /St/St | |
| Pm-149 | - | 7.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Pm-150 | - | 2.E-06 | 2.E-06 | - | 8.E+04 | 8.E+04 | /ET/ET | |
| Pm-151 | - | 9.E-07 | 8.E-07 | - | 3.E+04 | 3.E+04 | /St/St | |
| Sm-141m | - | 5.E-06 | - | - | 2.E+05 | - | /ET/ | |
| Sm-141 | - | 1.E-05 | - | - | 4.E+05 | - | /ET/ | |
| Sm-142 | - | 4.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Sm-145 | - | 4.E-07 | - | - | 1.E+04 | - | /BS/ | |
| Sm-146 | - | 2.E-11 | - | - | 1.E+00 | - | /BS/ | |
| Sm-147 | - | 2.E-11 | - | - | 1.E+00 | - | /BS/ | |
| Sm-151 | - | 7.E-08 | - | - | 2.E+03 | - | /BS/ | |
| Sm-153 | - | 8.E-07 | - | - | 3.E+04 | - | /St/ | |
| Sm-155 | - | 1.E-05 | - | - | 3.E+05 | - | /ET/ | |
| Sm-156 | - | 2.E-06 | - | - | 7.E+04 | - | /St/ | |
| Eu-145 | - | 5.E-07 | - | - | 2.E+04 | - | /ET/ | |
| Eu-146 | - | 3.E-07 | - | - | 1.E+04 | - | /ET/ | |
| Eu-147 | - | 5.E-07 | - | - | 2.E+04 | - | /St/ | |
| Eu-148 | - | 2.E-07 | - | - | 9.E+03 | - | /St/ | |
| Eu-149 | - | 2.E-06 | - | - | 9.E+04 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|----------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Eu-150 (12 h) | - | 2.E-06 | - | - | 7.E+04 | - | /St/ | |
| Eu-150 (34 yr) | - | 1.E-08 | - | - | 6.E+02 | - | /St/ | |
| Eu-152m | - | 1.E-06 | - | - | 6.E+04 | - | /St/ | |
| Eu-152 | - | 2.E-08 | - | - | 7.E+02 | - | /St/ | |
| Eu-154 | - | 1.E-08 | - | - | 5.E+02 | - | /St/ | |
| Eu-155 | - | 7.E-08 | - | - | 2.E+03 | - | /BS/ | |
| Eu-156 | - | 1.E-07 | - | - | 6.E+03 | - | /St/ | |
| Eu-157 | - | 1.E-06 | - | - | 4.E+04 | - | /St/ | |
| Eu-158 | - | 5.E-6 | - | - | 1.E+05 | - | /ET/ | |
| Gd-145 | 9.E-06 | 7.E-06 | - | 3.E+05 | 2.E+05 | - | ET/ET/ | |
| Gd-146 | 1.E-07 | 1.E-07 | - | 4.E+03 | 4.E+03 | - | St/St/ | |
| Gd-147 | 7.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |
| Gd-148 | 5.E-12 | 2.E-11 | - | 2.E-01 | 9.E-01 | - | BS/BS/ | |
| Gd-149 | 1.E-06 | 7.E-07 | - | 4.E+04 | 2.E+04 | - | St/St/ | |
| Gd-151 | 2.E-07 | 8.E-07 | - | 9.E+03 | 3.E+04 | - | BS/St/ | |
| Gd-152 | 7.E-12 | 3.E-11 | - | 2.E-01 | 1.E+00 | - | BS/BS/ | |
| Gd-153 | 9.E-08 | 4.E-07 | - | 3.E+03 | 1.E+04 | - | BS/St/ | |
| Gd-159 | 3.E-06 | 1.E-06 | - | 1.E+05 | 5.E+04 | - | St/St/ | |
| Tb-147 | - | 2.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Tb-149 | - | 1.E-07 | - | - | 6.E+03 | - | /St/ | |
| Tb-150 | - | 2.E-06 | - | - | 8.E+04 | - | /ET/ | |
| Tb-151 | - | 1.E-06 | - | - | 4.E+04 | - | /ET/ | |
| Tb-153 | - | 2.E-06 | - | - | 8.E+04 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|----------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Tb-154 | - | 5.E-07 | - | - | 2.E+04 | - | /ET/ | |
| Tb-155 | - | 2.E-06 | - | - | 8.E+04 | - | /St/ | |
| Tb-156m (24 h) | - | 2.E-06 | - | - | 9.E+04 | - | /St/ | |
| Tb-156m (5 h) | - | 4.E-06 | - | - | 1.E+05 | - | /St/ | |
| Tb-156 | - | 4.E-07 | - | - | 1.E+04 | - | /E/ | |
| Tb-157 | - | 2.E-07 | - | - | 8.E+03 | - | /BS/ | |
| Tb-158 | - | 1.E-08 | - | - | 6.E+02 | - | /BS/ | |
| Tb-160 | - | 1.E-07 | - | - | 3.E+03 | - | /St/ | |
| Tb-161 | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| Dy-155 | - | 2.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Dy-157 | - | 5.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Dy-159 | - | 2.E-06 | - | - | 8.E+04 | - | /BS/ | |
| Dy-165 | - | 6.E-06 | - | - | 2.E+05 | - | /ET/ | |
| Dy-166 | - | 3.E-07 | - | - | 1.E+04 | - | /St/ | |
| Ho-155 | - | 1.E-05 | - | - | 4.E+05 | - | /ET/ | |
| Ho-157 | - | 2.E-05 | - | - | 1.E+06 | - | /ET/ | |
| Ho-159 | - | 2.E-05 | - | - | 9.E+05 | - | /ET/ | |
| Ho-161 | - | 3.E-05 | - | - | 1.E+06 | - | /ET/ | |
| Ho-162m | - | 9.E-06 | - | - | 3.E+05 | - | /ET/ | |
| Ho-162 | - | 5.E-05 | - | - | 2.E+06 | - | /ET/ | |
| Ho-164m | - | 3.E-05 | - | - | 1.E+06 | - | /St/ | |
| Ho-164 | - | 2.E-05 | - | - | 8.E+05 | - | /ET/ | |
| Ho-166m | - | 7.E-09 | - | - | 2.E+02 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ho-166 | - | 6.E-07 | - | - | 2.E+04 | - | /St/ | |
| Ho-167 | - | 4.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Er-161 | - | 3.E-06 | - | - | 1.E+05 | - | /ET/ | |
| Er-165 | - | 2.E-05 | - | - | 1.E+06 | - | /ET/ | |
| Er-169 | - | 6.E-07 | - | - | 2.E+04 | - | /St/ | |
| Er-171 | - | 1.E-06 | - | - | 6.E+04 | - | /St/ | |
| Er-172 | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| Tm-162 | - | 9.E-06 | - | - | 3E+05 | - | /ET/ | |
| Tm-166 | - | 1.E-06 | - | - | 4.E+04 | - | /ET/ | |
| Tm-167 | - | 5.E-07 | - | - | 2.E+04 | - | /St/ | |
| Tm-170 | - | 1.E-07 | - | - | 4.E+03 | - | /St/ | |
| Tm-171 | - | 2.E-07 | - | - | 9.E+03 | - | /BS/ | |
| Tm-172 | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| Tm-173 | - | 2.E-06 | - | - | 8.E+04 | - | /St/ | |
| Tm-175 | - | 8.E-06 | - | - | 2.E+05 | - | /ET/ | |
| Yb-162 | - | 1.E-05 | 1.E-05 | - | 5.E+05 | 5.E+05 | /ET/ET | |
| Yb-166 | - | 6.E-07 | 5.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Yb-167 | - | 3.E-05 | 3.E-05 | - | 1.E+06 | 1.E+06 | /ET/ET | |
| Yb-169 | - | 2.E-07 | 2.E-07 | - | 9.E+03 | 8.E+03 | /St/St | |
| Yb-175 | - | 8.E-07 | 8.E-07 | - | 3.E+04 | 2.E+04 | /St/St | |
| Yb-177 | - | 6.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Yb-178 | - | 5.E-06 | 5.E-06 | - | 1.E+05 | 1.E+05 | /ET/E | |
| Lu-169 | - | 9.E-07 | 9.E-07 | - | 3.E+04 | 3.E+04 | /ET/ET | |
| Lu-170 | - | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | /ET/ET | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Lu-171 | - | 6.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | /St/St | |
| Lu-172 | - | 3.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Lu-173 | - | 2.E-07 | 4.E-07 | - | 8.E+03 | 1.E+04 | /BS/St | |
| Lu-174m | - | 2.E-07 | 2.E-07 | - | 7.E+03 | 8.E+03 | /BS/St | |
| Lu-174 | - | 9.E-08 | 2.E-07 | - | 3.E+03 | 8.E+03 | /BS/St | |
| Lu-176m | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /St/St | |
| Lu-176 | - | 3.E-09 | 1.E-08 | - | 1.E+02 | 6.E+02 | /BS/St | |
| Lu-177m | - | 5.E-08 | 4.E-08 | - | 2.E+03 | 1.E+03 | /St/St | |
| Lu-177 | - | 5.E-07 | 5.E-07 | - | 2.E+04 | 1.E+04 | /St/St | |
| Lu-178m | - | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Lu-178 | - | 8.E-06 | 8.E-06 | - | 3.E+05 | 3.E+05 | /ET/ET | |
| Lu-179 | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /St/St | |
| Hf-170 | 1.E-06 | 1.E-06 | - | 4.E+04 | 4.E+04 | - | ET/ET/ | |
| Hf-172 | 6.E-09 | 3.E-08 | - | 2.E+02 | 1.E+03 | - | BS/BS/ | |
| Hf-173 | 2.E-06 | 2.E-06 | - | 9.E+04 | 8.E+04 | - | ET/ET/ | |
| Hf-175 | 5.E-07 | 6.E-07 | - | 2.E+04 | 2.E+04 | - | BS/St/ | |
| Hf-177m | 2.E-06 | 1.E-06 | - | 9.E+04 | 6.E+04 | - | ET/ET/ | |
| Hf-178m | 8.E-10 | 4.E-09 | - | 3.E+01 | 1.E+02 | - | BS/BS/ | |
| Hf-179m | 2.E-07 | 1.E-07 | - | 8.E+03 | 6.E+03 | - | BS/St/ | |
| Hf-180m | 2.E-06 | 1.E-06 | - | 7.E+04 | 6.E+04 | - | ET/ET/ | |
| Hf-181 | 1.E-07 | 1.E-07 | - | 4.E+03 | 5.E+03 | - | BS/St/ | |
| Hf-182m | 5.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| Hf-182 | 5.E-10 | 2.E-09 | - | 2.E+01 | 9.E+01 | - | BS/BS/ | |
| Hf-183 | 6.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Hf-184 | 1.E-06 | 1.E-06 | - | 5.E+04 | 4.E+04 | - | ET/St/ | |
| Ta-172 | - | 5.E-06 | 5.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Ta-173 | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /E/E | |
| Ta-174 | - | 5.E-06 | 5.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Ta-175 | - | 1.E-06 | 1.E-06 | - | 6.E+04 | 6.E+04 | /ET/ET | |
| Ta-176 | - | 1.E-06 | 1.E-06 | - | 3.E+04 | 3.E+04 | /ET/ET | |
| Ta-177 | - | 4.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | /St/St | |
| Ta-178 | - | 3.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | /ET/ET | |
| Ta-179 | - | 4.E-06 | 1.E-06 | - | 1.E+05 | 7.E+04 | /St/St | |
| Ta-180m | - | 9.E-06 | 9.E-06 | - | 3.E+05 | 3.E+05 | /St/St | |
| Ta-180 | - | 1.E-07 | 4.E-08 | - | 4.E+03 | 1.E+03 | /St/St | |
| Ta-182m | - | 6.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| Ta-182 | - | 9.E-08 | 7.E-08 | - | 3.E+03 | 2.E+03 | /St/St | |
| Ta-183 | - | 3.E-07 | 2.E-07 | - | 1.E+04 | 1.E+04 | /St/St | |
| Ta-184 | - | 8.E-07 | 8.E-07 | - | 3.E+04 | 3.E+04 | /ET/ET | |
| Ta-185 | - | 5.E-06 | 5.E-06 | - | 2.E+05 | 1.E+05 | /ET/ET | |
| Ta-186 | - | 7.E-06 | 7.E-06 | - | 2.E+05 | 2.E+05 | /ET/ET | |
| W-176 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| W-177 | 5.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| W-178 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| W-179 | 1.E-04 | - | - | 5.E+06 | - | - | ET/ / | |
| W-181 | 1.E-05 | - | - | 4.E+05 | - | - | ET/ / | |
| W-185 | 2.E-06 | - | - | 9.E+04 | - | - | St/ / | |
| W-187 | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|---------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| W-188 | 6.E-07 | - | - | 2.E+04 | - | - | St/ / | |
| Re-177 | 1.E-05 | 1.E-05 | - | 6.E+05 | 4.E+05 | - | ET/ET/ | |
| Re-178 | 1.E-05 | 1.E-05 | - | 5.E+05 | 3.E+05 | - | ET/ET/ | |
| Re-181 | 1.E-06 | 1.E-06 | - | 5.E+04 | 4.E+04 | - | ET/ET/ | |
| Re-182 (64 h) | 4.E-07 | 3.E-07 | - | 1.E+04 | 1.E+04 | - | ET/St/ | |
| Re-182 (12 h) | 1.E-06 | 1.E-06 | - | 4.E+04 | 4.E+04 | - | ET/ET/ | |
| Re-184m | 6.E-07 | 1.E-07 | - | 2.E+04 | 4.E+03 | - | St/St/ | |
| Re-184 | 7.E-07 | 3.E-07 | - | 2.E+04 | 1.E+04 | - | ET/St/ | |
| Re-186m | 4.E-7 | 7.E-08 | - | 1.E+04 | 2.E+03 | - | St/St/ | |
| Re-186 | 7.E-07 | 4.E-07 | - | 2.E+04 | 1.E+04 | - | St/St/ | |
| Re-187 | 2.E-04 | 1.E-04 | - | 8.E+06 | 4.E+06 | - | St/St/ | |
| Re-188m | 3.E-05 | 2.E-05 | - | 1.E+06 | 1.E+06 | - | St/St/ | |
| Re-188 | 8.E-07 | 7.E-07 | - | 3.E+04 | 2.E+04 | - | St/St/ | |
| Re-189 | 1.E-06 | 9.E-07 | - | 4.E+04 | 3.E+04 | - | St/St/ | |
| Os-180 | 1.E-05 | 1.E-05 | 1.E-05 | 5.E+05 | 3.E+05 | 3.E+05 | ET/ET/ET | |
| Os-181 | 3.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Os-182 | 1.E-06 | 9.E-07 | 9.E-07 | 3.E+04 | 3.E+04 | 3.E+04 | ET/ET/ET | |
| Os-185 | 4.E-07 | 5.E-07 | 5.E-07 | 1.E+04 | 2.E+04 | 1.E+04 | St/St/St | |
| Os-189m | 1.E-04 | 7.E-05 | 7.E-05 | 4.E+06 | 2.E+06 | 2.E+06 | St/St/St | |
| Os-191m | 1.E-05 | 4.E-06 | 4.E-06 | 5.E+05 | 1.E+05 | 1.E+05 | St/St/St | |
| Os-191 | 1.E-06 | 4.E-07 | 3.E-07 | 5.E+04 | 1.E+04 | 1.E+04 | St/St/St | |
| Os-193 | 2.E-06 | 8.E-07 | 8.E-07 | 7.E+04 | 3.E+04 | 3.E+04 | St/St/St | |
| Os-194 | 4.E-08 | 4.E-08 | 1.E-08 | 1.E+03 | 1.E+03 | 4.E+02 | St/St/St | |
| Ir-182 | 9.E-06 | 7.E-06 | 7.E-06 | 3.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|---------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ir-184 | 1.E-06 | 1.E-06 | 1.E-06 | 7.E+04 | 6.E+04 | 7.E+04 | ET/ET/ET | |
| Ir-185 | 2.E-06 | 1.E-06 | 1.E-06 | 7.E+04 | 7.E+04 | 7.E+04 | ET/ET/ET | |
| Ir-186 (16 h) | 8.E-07 | 7.E-07 | 7.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | ET/ET/ET | |
| Ir-186 (2 h) | 5.E-06 | 4.E-06 | 4.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Ir-187 | 4.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Ir-188 | 6.E-07 | 6.E-07 | 6.E-07 | 2.E+04 | 2.E+04 | 2.E+04 | ET/ET/ET | |
| Ir-189 | 3.E-06 | 1.E-06 | 1.E-06 | 1.E+05 | 5.E+04 | 4.E+04 | St/St/St | |
| Ir-190m (3 h) | 2.E-06 | 2.E-06 | 2.E-06 | 8.E+04 | 8.E+04 | 7.E+04 | ET/ET/ET | |
| Ir-190m (1 h) | 9.E-05 | 5.E-05 | 5.E-05 | 3.E+06 | 2.E+06 | 1.E+06 | ET/St/St | |
| Ir-190 | 4.E-07 | 2.E-07 | 2.E-07 | 1.E+04 | 9.E+03 | 8.E+03 | ET/St/St | |
| Ir-192m | 1.E-07 | 1.E-07 | 2.E-08 | 3.E+03 | 6.E+03 | 1.E+03 | St/St/St | |
| Ir-192 | 2.E-07 | 1.E-07 | 1.E-07 | 9.E+03 | 5.E+03 | 4.E+03 | St/St/St | |
| Ir-194m | 8.E-08 | 8.E-08 | 6.E-08 | 3.E+03 | 3.E+03 | 2.E+03 | St/St/St | |
| Ir-194 | 1.E-06 | 7.E-07 | 7.E-07 | 5.E+04 | 2.E+04 | 2.E+04 | St/St/St | |
| Ir-195m | 2.E-06 | 2.E-06 | 2.E-06 | 9.E+04 | 7.E+04 | 7.E+04 | ET/ET/ET | |
| Ir-195 | 7.E-06 | 5.E-06 | 4.E-06 | 2.E+05 | 1.E+05 | 1.E+05 | ET/ET/ET | |
| Pt-186 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Pt-188 | 8.E-07 | - | - | 3.E+04 | - | - | E/ / | |
| Pt-189 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Pt-191 | 1.E-06 | - | - | 7.E+04 | - | - | ET/ / | |
| Pt-193m | 2.E-06 | - | - | 8.E+04 | - | - | ET/ / | |
| Pt-193 | 2.E-05 | - | - | 7.E+05 | - | - | ET/ / | |
| Pt-195m | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |
| Pt-197m | 7.E-06 | - | - | 2.E+05 | - | - | ET/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Pt-197 | 3.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Pt-199 | 1.E-05 | - | - | 4.E+05 | - | - | ET/ / | |
| Pt-200 | 1.E-06 | - | - | 5.E+04 | - | - | St/ / | |
| Au-193 | 4.E-06 | 3.E-06 | 3.E-06 | 1.E+05 | 1.E+05 | 1.E+05 | ET/E/St | |
| Au-194 | 9.E-07 | 9.E-07 | 9.E-07 | 3.E+04 | 3.E+04 | 3.E+04 | ET/ET/ET | |
| Au-195 | 3.E-06 | 7.E-07 | 4.E-07 | 1.E+05 | 2.E+04 | 1.E+04 | ET/St/St | |
| Au-198m | 6.E-07 | 2.E-07 | 2.E-07 | 2.E+04 | 1.E+04 | 1.E+04 | ET/St/St | |
| Au-198 | 1.E-06 | 5.E-07 | 5.E-07 | 4.E+04 | 2.E+04 | 1.E+04 | ET/St/St | |
| Au-199 | 2.E-06 | 8.E-07 | 7.E-07 | 7.E+04 | 3.E+04 | 2.E+04 | ET/St/St | |
| Au-200m | 5.E-07 | 4.E-07 | 4.E-07 | 1.E+04 | 1.E+04 | 1.E+04 | ET/ET/ET | |
| Au-200 | 1.E-05 | 7.E-06 | 7.E-06 | 4.E+05 | 2.E+05 | 2.E+05 | ET/ET/ET | |
| Au-201 | 1.E-05 | 1.E-05 | 9.E-06 | 5.E+05 | 3.E+05 | 3.E+05 | ET/ET/ET | |
| Hg-193m (Org) | 1.E-06 | - | - | 4.E+04 | - | - | ET/ / | |
| Hg-193m | 1.E-06 | 1.E-06 | - | 4.E+04 | 4.E+04 | - | ET/ET/ | |
| Hg-193m (Vapor) | - | 1.E-07 | - | - | 6.E+03 | - | /St/ | |
| Hg-193 (Org) | 5.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Hg-193 | 5.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Hg-193 (Vapor) | - | 5.E-07 | - | - | 1.E+04 | - | /St/ | |
| Hg-194 (Org) | 2.E-08 | - | - | 1.E+03 | - | - | St/ / | |
| Hg-194 | 3.E-08 | 1.E-07 | - | 1.E+03 | 3.E+03 | - | St/St/ | |
| Hg-194 (Vapor) | - | 1.E-08 | - | - | 5.E+02 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Hg-195m (Org) | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |
| Hg-195m | 1.E-06 | 8.E-07 | - | 5.E+04 | 3.E+04 | - | ET/St/ | |
| Hg-195m (Vapor) | - | 6.E-08 | - | - | 2.E+03 | - | /St/ | |
| Hg-195 (Org) | 6.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Hg-195 | 6.E-06 | 6.E-06 | - | 2.E+05 | 2.E+05 | - | ET/ET/ | |
| Hg-195 (Vapor) | - | 4.E-07 | - | - | 1.E+04 | - | /St/ | |
| Hg-197m (Org) | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |
| Hg-197m | 1.E-06 | 8.E-07 | - | 5.E+04 | 3.E+04 | - | ET/St/ | |
| Hg-197m (Vapor) | - | 9.E-08 | - | - | 3.E+03 | - | /St/ | |
| Hg-197 (Org) | 4.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Hg-197 | 4.E-06 | 2.E-06 | - | 1.E+05 | 7.E+04 | - | ET/St/ | |
| Hg-197 (Vapor) | - | 1.E-07 | - | - | 4.E+03 | - | /St/ | |
| Hg-199m (Org) | 8.E-06 | - | - | 3.E+05 | - | - | ET/ / | |
| Hg-199m | 8.E-06 | 5.E-06 | - | 3.E+05 | 1.E+05 | - | ET/ET/ | |
| Hg-199m (Vapor) | - | 3.E-06 | - | - | 1.E+05 | - | /St/ | |
| Hg-203 (Org) | 7.E-07 | - | - | 2.E+04 | - | - | St/ / | |
| Hg-203 | 9.E-07 | 2.E-07 | - | 3.E+04 | 1.E+04 | - | St/St/ | |
| Hg-203 (Vapor) | - | 8.E-08 | - | - | 2.E+03 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|---|---|----------------------------|---|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Tl-194m | 5.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Tl-194 | 2.E-05 | - | - | 8.E+05 | - | - | ET/ / | |
| Tl-195 | 6.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Tl-197 | 8.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Tl-198m | 2.E-06 | - | - | 9.E+04 | - | - | ET/ / | |
| Tl-198 | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |
| Tl-199 | 5.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Tl-200 | 8.E-07 | - | - | 3.E+04 | - | - | ET/ / | |
| Tl-201 | 4.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Tl-202 | 1.E-06 | - | - | 5.E+04 | - | - | ET/ / | |
| Tl-204 | 9.E-07 | - | - | 3.E+04 | - | - | St/ / | |
| Pb-195m | 7.E-06 | - | - | 2.E+05 | - | - | ET/ / | |
| Pb-198 | 2.E-06 | - | - | 9.E+04 | - | - | ET/ / | |
| Pb-199 | 4.E-06 | - | - | 1.E+05 | - | - | ET/ / | |
| Pb-200 | 1.E-06 | - | - | 4.E+04 | - | - | ET/ / | |
| Pb-201 | 2.E-06 | - | - | 7.E+04 | - | - | ET/ / | |
| Pb-202m | 1.E-06 | - | - | 6.E+04 | - | - | ET/ / | |
| Pb-202 | 4.E-08 | - | - | 1.E+03 | - | - | St/ / | |
| Pb-203 | 2.E-06 | - | - | 7.E+04 | - | - | ET/ / | |
| Pb-205 | 9.E-07 | - | - | 3.E+04 | - | - | BS/ / | |
| Pb-209 | 9.E-06 | - | - | 3.E+05 | - | - | ET/ / | |
| Pb-210 | 1.E-10 | - | - | 5.E+00 | - | - | BS/ / | |
| Pb-211 | 4.E-08 | - | - | 1.E+03 | - | - | ET/ / | |
| Pb-212 | 5.E-09 | - | - | 2.E+02 | - | - | ET/ / | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|---------------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Pb-214 | 4.E-08 | - | - | 1.E+03 | - | - | ET/ / | |
| Bi-200 | 5.E-06 | 4.E-06 | - | 2.E+05 | 1.E+05 | - | ET/ET/ | |
| Bi-201 | 3.E-06 | 2.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Bi-202 | 2.E-06 | 2.E-06 | - | 9.E+04 | 9.E+04 | - | ET/ET/ | |
| Bi-203 | 7.E-07 | 7.E-07 | - | 2.E+04 | 2.E+04 | - | ET/ET/ | |
| Bi-205 | 4.E-07 | 4.E-07 | - | 1.E+04 | 1.E+04 | - | ET/ET/ | |
| Bi-206 | 2.E-07 | 2.E-07 | - | 9.E+03 | 8.E+03 | - | ET/ET/ | |
| Bi-207 | 4.E-07 | 1.E-07 | - | 1.E+04 | 6.E+03 | - | ET/St/ | |
| Bi-210m | 3.E-09 | 2.E-10 | - | 1.E+02 | 9.E+00 | - | K/St/ | |
| Bi-210 | 1.E-07 | 9.E-09 | - | 6.E+03 | 3.E+02 | - | K/St/ | |
| Bi-212 | 1.E-08 | 8.E-09 | - | 4.E+02 | 3.E+02 | - | ET/ET/ | |
| Bi-213 | 1.E-08 | 7.E-09 | - | 4.E+02 | 2.E+02 | - | ET/ET/ | |
| Bi-214 | 1.E-08 | 1.E-08 | - | 6.E+02 | 4.E+02 | - | ET/ET/ | |
| Po-203 | 5.E-06 | 4.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Po-205 | 4.E-06 | 3.E-06 | - | 1.E+05 | 1.E+05 | - | ET/ET/ | |
| Po-207 | 1.E-06 | 1.E-06 | - | 7.E+04 | 6.E+04 | - | ET/ET/ | |
| Po-210 | 7.E-10 | 2.E-10 | - | 2.E+01 | 9.E+00 | - | K/St/ | |
| At-207 | 1.E-06 | 2.E-07 | - | 4.E+04 | 1.E+04 | - | St/St/ | |
| At-211 | 7.E-09 | 5.E-09 | - | 2.E+02 | 1.E+02 | - | ET/St/ | |
| Rn-220 ⁵ | 1.E-08 | - | - | 6.E+02 | - | - | - | |
| Rn-222 ⁵ | 8.E-08 | - | - | 3.E+03 | - | - | - | |
| Fr-222 | 1.E-08 | - | - | 3.E+02 | - | - | ET/ / | |
| Fr-223 | 4.E-07 | - | - | 1.E+04 | - | - | St/ / | |
| Ra-223 | - | 9.E-11 | - | - | 3.E+00 | - | /St/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Ra-224 | - | 2.E-10 | - | - | 8.E+00 | - | /St/ | |
| Ra-225 | - | 1.E-10 | - | - | 4.E+00 | - | /St/ | |
| Ra-226 | - | 2.E-10 | - | - | 9.E+00 | - | /St/ | |
| Ra-227 | - | 8.E-07 | - | - | 3.E+04 | - | /BS/ | |
| Ra-228 | - | 1.E-10 | - | - | 5.E+00 | - | /BS/ | |
| Ac-224 | 1.E-08 | 6.E-09 | 5.E-09 | 6.E+02 | 2.E+02 | 2.E+02 | BS/St/St | |
| Ac-225 | 2.E-10 | 9.E-11 | 8.E-11 | 7.E+00 | 3.E+00 | 3.E+00 | BS/St/St | |
| Ac-226 | 1.E-09 | 6.E-10 | 5.E-10 | 4.E+01 | 2.E+01 | 2.E+01 | ET/St/St | |
| Ac-227 | 2.E-13 | 1.E-12 | 1.E-11 | 1.E-02 | 5.E-02 | 4.E-01 | BS/BS/St | |
| Ac-228 | 6.E-09 | 3.E-08 | 4.E-08 | 2.E+02 | 1.E+03 | 1.E+03 | BS/BS/St | |
| Th-226 | - | 4.E-09 | 4.E-09 | - | 1.E+02 | 1.E+02 | /ET/ET | |
| Th-227 | - | 9.E-11 | 7.E-11 | - | 3.E+00 | 2.E+00 | /St/St | |
| Th-228 | - | 2.E-11 | 2.E-11 | - | 7.E-01 | 8.E-01 | /BS/St | |
| Th-229 | - | 2.E-12 | 1.E-11 | - | 7.E-02 | 4.E-01 | /BS/St | |
| Th-230 | - | 3.E-12 | 4.E-11 | - | 1.E-01 | 1.E+00 | /BS/BS | |
| Th-231 | - | 1.E-06 | 1.E-06 | - | 5.E+04 | 5.E+04 | /St/St | |
| Th-232 | - | 3.E-12 | 4.E-11 | - | 1.E-01 | 1.E+00 | /BS/BS | |
| Th-234 | - | 1.E-07 | 9.E-08 | - | 3.E+03 | 3.E+03 | /St/St | |
| Pa-227 | - | 4.E-09 | 4.E-09 | - | 1.E+02 | 1.E+02 | /ET/ET | |
| Pa-228 | - | 1.E-08 | 1.E-08 | - | 3.E+02 | 4.E+02 | /BS/St | |
| Pa-230 | - | 1.E-09 | 9.E-10 | - | 4.E+01 | 3.E+01 | /St/St | |
| Pa-231 | - | 1.E-12 | 1.E-11 | - | 4.E-02 | 4.E-01 | /BS/BS | |
| Pa-232 | - | 1.E-08 | 1.E-07 | - | 6.E+02 | 7.E+03 | /BS/BS | |
| Pa-233 | - | 2.E-07 | 1.E-07 | - | 7.E+03 | 6.E+03 | /St/St | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|-----------------------|----------------------------|--------|--------|----------------------------|--------|--------|--|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Pa-234 | - | 7.E-07 | 7.E-07 | - | 2.E+04 | 2.E+04 | /ET/ET | |
| U-230 | 6.E-10 | 5.E-11 | 4.E-11 | 2.E+01 | 2.E+00 | 1.E+00 | K/St/St | |
| U-231 | 2.E-06 | 1.E-06 | 1.E-06 | 8.E+04 | 4.E+04 | 4.E+04 | ET/St/St | |
| U-232 | 5.E-11 | 1.E-10 | 2.E-11 | 2.E+00 | 4.E+00 | 7.E-01 | BS/St/ET | |
| U-233 | 4.E-10 | 2.E-10 | 7.E-11 | 1.E+01 | 9.E+00 | 2.E+00 | BS/St/ET | |
| U-234 | 5.E-10 | 2.E-10 | 7.E-11 | 1.E+01 | 9.E+00 | 2.E+00 | BS/St/ET | |
| U-235 | 5.E-10 | 3.E-10 | 8.E-11 | 1.E+01 | 1.E+01 | 3.E+00 | BS/St/ET | |
| U-236 | 5.E-10 | 2.E-10 | 7.E-11 | 1.E+01 | 1.E+01 | 2.E+00 | BS/St/ET | |
| U-237 | 1.E-06 | 3.E-07 | 3.E-07 | 4.E+04 | 1.E+04 | 1.E+04 | ET/St/St | |
| U-238 | 5.E-10 | 3.E-10 | 8.E-11 | 2.E+01 | 1.E+01 | 3.E+00 | BS/St/ET | |
| U-239 | 1.E-05 | 9.E-06 | 9.E-06 | 5.E+05 | 3.E+05 | 3.E+05 | ET/ET/ET | |
| U-240 | 1.E-06 | 7.E-07 | 6.E-07 | 5.E+04 | 2.E+04 | 2.E+04 | ET/St/St | |
| Np-232 | - | 3.E-06 | - | - | 1.E+05 | - | /BS/ | |
| Np-233 | - | 7.E-05 | - | - | 2.E+06 | - | /ET/ | |
| Np-234 | - | 5.E-07 | - | - | 2.E+04 | - | /ET/ | |
| Np-235 | - | 1.E-06 | - | - | 4.E+04 | - | /BS/ | |
| Np-236 (1.E+05 yr) | - | 4.E-11 | - | - | 1.E+00 | - | /BS/ | |
| Np-236 (22 h) | - | 5.E-08 | - | - | 1.E+03 | - | /BS/ | |
| Np-237 | - | 8.E-12 | - | - | 3.E-01 | - | /BS/ | |
| Np-238 | - | 1.E-07 | - | - | 4.E+03 | - | /BS/ | |
| Np-239 | - | 5.E-07 | - | - | 1.E+04 | - | /St/ | |
| Np-240 | - | 2.E-06 | - | - | 8.E+04 | - | /ET/ | |
| Pu-234 | - | 3.E-08 | 3.E-08 | - | 1.E+03 | 1.E+03 | /St/St | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|--------|----------------------------|--------|--------|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Pu-235 | - | 9.E-05 | 8.E-05 | - | 3.E+06 | 3.E+06 | /ET/ET | |
| Pu-236 | - | 1.E-11 | 7.E-11 | - | 6.E-01 | 2.E+00 | /BS/St | |
| Pu-237 | - | 1.E-06 | 1.E-06 | - | 7.E+04 | 6.E+04 | /St/St | |
| Pu-238 | - | 6.E-12 | 5.E-11 | - | 2.E-01 | 1.E+00 | /BS/St | |
| Pu-239 | - | 5.E-12 | 6.E-11 | - | 2.E-01 | 2.E+00 | /BS/BS | |
| Pu-240 | - | 5.E-12 | 6.E-11 | - | 2.E-01 | 2.E+00 | /BS/BS | |
| Pu-241 | - | 2.E-10 | 2.E-09 | - | 1.E+01 | 1.E+02 | /BS/BS | |
| Pu-242 | - | 5.E-12 | 6.E-11 | - | 2.E-01 | 2.E+00 | /BS/BS | |
| Pu-243 | - | 5.E-06 | 5.E-06 | - | 1.E+05 | 1.E+05 | /E/E | |
| Pu-244 | - | 5.E-12 | 6.E-11 | - | 2.E-01 | 2.E+00 | /BS/BS | |
| Pu-245 | - | 9.E-07 | 8.E-07 | - | 3.E+04 | 3.E+04 | /St/St | |
| Pu-246 | - | 8.E-08 | 8.E-08 | - | 3.E+03 | 2.E+03 | /St/St | |
| Am-237 | - | 8.E-06 | - | - | 3.E+05 | - | /ET/ | |
| Am-238 | - | 2.E-06 | - | - | 9.E+04 | - | /BS/ | |
| Am-239 | - | 1.E-06 | - | - | 6.E+04 | - | /ET/ | |
| Am-240 | - | 7.E-07 | - | - | 2.E+04 | - | /ET/ | |
| Am-241 | - | 5.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Am-242m | - | 5.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Am-242 | - | 4.E-08 | - | - | 1.E+03 | - | /St/ | |
| Am-243 | - | 5.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Am-244m | - | 3.E-06 | - | - | 1.E+05 | - | /BS/ | |
| Am-244 | - | 1.E-07 | - | - | 5.E+03 | - | /BS/ | |
| Am-245 | - | 5.E-06 | - | - | 2.E+05 | - | /ET/ | |
| Am-246m | - | 6.E-06 | - | - | 2.E+05 | - | /ET/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|---|----------------------------|--------|---|---|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Am-246 | - | 2.E-06 | - | - | 9.E+04 | - | /ET/ | |
| Cm-238 | - | 1.E-07 | - | - | 4.E+03 | - | /St/ | |
| Cm-240 | - | 2.E-10 | - | - | 7.E+00 | - | /St/ | |
| Cm-241 | - | 2.E-08 | - | - | 8.E+02 | - | /St/ | |
| Cm-242 | - | 1.E-10 | - | - | 5.E+00 | - | /St/ | |
| Cm-243 | - | 7.E-12 | - | - | 2.E-01 | - | /BS/ | |
| Cm-244 | - | 9.E-12 | - | - | 3.E-01 | - | /BS/ | |
| Cm-245 | - | 5.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Cm-246 | - | 5.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Cm-247 | - | 5.E-12 | - | - | 2.E-01 | - | /BS/ | |
| Cm-248 | - | 1.E-12 | - | - | 5.E-02 | - | /BS/ | |
| Cm-249 | - | 8.E-06 | - | - | 3.E+05 | - | /ET/ | |
| Cm-250 | - | 2.E-13 | - | - | 8.E-03 | - | /BS/ | |
| Bk-245 | - | 3.E-07 | - | - | 1.E+04 | - | /St/ | |
| Bk-246 | - | 8.E-07 | - | - | 3.E+04 | - | /ET/ | |
| Bk-247 | - | 3.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Bk-249 | - | 1.E-09 | - | - | 5.E+01 | - | /BS/ | |
| Bk-250 | - | 2.E-07 | - | - | 9.E+03 | - | /BS/ | |
| Cf-244 | - | 1.E-08 | - | - | 5.E+02 | - | /ET/ | |
| Cf-246 | - | 1.E-09 | - | - | 5.E+01 | - | /St/ | |
| Cf-248 | - | 5.E-11 | - | - | 2.E+00 | - | /BS/ | |
| Cf-249 | - | 3.E-12 | - | - | 1.E-01 | - | /BS/ | |
| Cf-250 | - | 7.E-12 | - | - | 2.E-01 | - | /BS/ | |
| Cf-251 | - | 3.E-12 | - | - | 1.E-01 | - | /BS/ | |

| Radionuclide | Material Type ³ | | | Material Type ³ | | | Stochastic or Organ ¹ (F/ M/ S) | |
|--------------|----------------------------|--------|---|----------------------------|--------|---|--|--|
| | $\mu\text{Ci}/\text{ml}$ | | | Bq/m^3 | | | | |
| | F | M | S | F | M | S | | |
| Cf-252 | - | 1.E-11 | - | - | 6.E-01 | - | /BS/ | |
| Cf-253 | - | 5.E-10 | - | - | 2.E+01 | - | /St/ | |
| Cf-254 | - | 2.E-11 | - | - | 8.E-01 | - | /BS/ | |
| Es-250 | - | 4.E-07 | - | - | 1.E+04 | - | /BS/ | |
| Es-251 | - | 3.E-07 | - | - | 1.E+04 | - | /St/ | |
| Es-253 | - | 2.E-10 | - | - | 9.E+00 | - | /St/ | |
| Es-254m | - | 1.E-09 | - | - | 5.E+01 | - | /St/ | |
| Es-254 | - | 6.E-11 | - | - | 2.E+00 | - | /BS/ | |
| Fm-252 | - | 2.E-09 | - | - | 8.E+01 | - | /St/ | |
| Fm-253 | - | 1.E-09 | - | - | 6.E+01 | - | /St/ | |
| Fm-254 | - | 6.E-09 | - | - | 2.E+02 | - | /ET/ | |
| Fm-255 | - | 2.E-09 | - | - | 8.E+01 | - | /St/ | |
| Fm-257 | - | 1.E-10 | - | - | 4.E+00 | - | /St/ | |
| Md-257 | - | 2.E-08 | - | - | 1.E+03 | - | /St/ | |
| Md-258 | - | 1.E-10 | - | - | 4.E+00 | - | /St/ | |

Footnotes for Appendix A

¹ A determination of whether DACs are controlled by stochastic (St) or nonstochastic (organ) dose, or if they both give the same result (E), for each lung retention class, is given in this column. The key to the organ notation for nonstochastic dose is: BS = Bone surface, ET = Extrathoracic, K = Kidney, L = Liver, and T = Thyroid. A blank indicates that no calculations were performed for the material type shown.

² ICRP identifies these materials as soluble or reactive gases and vapors or highly soluble or reactive gases and vapors. For tritiated water, the inhalation DAC values allow for an additional 50 percent absorption through the skin, as described in ICRP Publication No. 68, "Dose Coefficients for Intakes of Radionuclides by Workers." For elemental tritium, DAC values include a factor that irradiation from gas within the lungs might increase the dose by 20 percent.

³ A dash indicates no values given for this data category.

⁴ DAC values derived using hafnium tritide particle and are based on observed activity (i.e, only radiation emitted from the particle is considered). DAC values derived using methodology found in Radiological Control Programs for Special Tritium Compounds, DOE-HDBK-1184-2004.

⁵ These values are appropriate for protection from radon combined with its short-lived daughters and are based on information given in ICRP Publication 65, "Protection Against Radon-222 at Home and at Work," and in DOE-STD-1121-98, "Internal Dosimetry." The values given are for 100 percent equilibrium concentration conditions of the radon daughters with the parent. To allow for an actual measured equilibrium concentration or a demonstrated equilibrium concentration, the values given in this table should be multiplied by the ratio (100 percent/actual percent) or (100 percent/demonstrated percent), respectively. Alternatively, DAC values for Rn-220 and Rn-222 may be replaced by 2.5 WL* and 0.83 WL*, respectively, for appropriate limiting of daughter concentrations.

* A "Working Level" is any combination of short-lived radon daughters, in one liter of air without regard to the degree of equilibrium, that will result in the ultimate emission of 1.3 E+05 MeV of alpha energy.

Table 2: Values for Establishing Sealed Radioactive Source Accountability and Radioactive Material Posting and Labeling Requirements Based Upon International Commission of Radiological Protection 68 Dose Conversion Factors

| Nuclide | Activity (μCi) | Nuclide | Activity (μCi) | Nuclide | Activity (μCi) |
|---------|-----------------------------|---------|-----------------------------|---------|-----------------------------|
| H-3 | 1.5E+08 | Sn-121m | 8.1E+05 | Ir-192 | 1.3E+02 |
| Be-7 | 3.1E+03 | Sn-123 | 1.3E+04 | Ir-192m | 1.4E+05 |
| Be-10 | 1.4E+05 | Sn-126 | 1.8E+02 | Ir-194m | 2.7E+01 |
| C-14 | 4.6E+06 | In-114m | 7.7E+02 | Pt-193 | 8.7E+07 |
| Na-22 | 1.9E+01 | Te-121m | 1.8E+02 | Hg-194 | 5.2E+04 |
| Al-26 | 1.5E+01 | Te-123m | 2.8E+02 | Hg-203 | 4.9E+02 |
| Si-32 | 4.9E+04 | Te-125m | 4.4E+02 | Au-195 | 4.8E+02 |
| S-35 | 2.4E+06 | Te-127m | 8.0E+02 | Pb-202 | 1.9E+05 |
| Cl-36 | 5.2E+05 | Te-129m | 2.3E+03 | Pb-205 | 9.0E+01 |
| K-40 | 2.7E+02 | Sb-124 | 9.1E+01 | Pb-210 | 9.2E+01 |
| Ca-41 | 9.3E+06 | Sb-125 | 6.7E+01 | Tl-204 | 2.2E+04 |
| Ti-44 | 1.5E+02 | I-125 | 3.5E+02 | Bi-207 | 1.7E+01 |
| Ca-45 | 1.1E+06 | I-129 | 1.8E+02 | Bi-208 | 1.5E+01 |
| Sc-46 | 6.2E+01 | Ba-133 | 5.1E+01 | Bi-210m | 1.2E+03 |
| V-49 | 1.0E+08 | Cs-134 | 2.6E+01 | Po-209 | 6.3E+03 |
| Mn-53 | 7.5E+07 | Cs-135 | 1.3E+06 | Po-210 | 1.2E+03 |
| Mn-54 | 6.5E+01 | Cs-137 | 6.0E+01 | Ra-226 | 2.2E+02 |
| Fe-55 | 2.9E+06 | La-137 | 2.7E+05 | Ra-228 | 1.5E+03 |
| Fe-59 | 1.9E+02 | Ce-139 | 2.4E+02 | Ac-227 | 4.2E+00 |
| Fe-60 | 8.1E+03 | Ce-141 | 2.4E+03 | Th-228 | 8.4E+01 |
| Co-56 | 3.9E+01 | Ce-144 | 1.4E+03 | Th-229 | 3.1E+01 |
| Co-57 | 2.3E+02 | Pm-143 | 1.3E+02 | Th-230 | 5.4E+00 |
| Co-58 | 1.3E+02 | Pm-144 | 2.9E+01 | Th-232 | 9.3E+01 |
| Co-60 | 1.7E+01 | Pm-145 | 2.6E+02 | Pa-231 | 3.0E+01 |
| Ni-59 | 3.2E+06 | Pm-146 | 4.4E+01 | U-232 | 1.0E+02 |
| Ni-63 | 1.3E+06 | Pm-147 | 7.7E+05 | U-233 | 3.9E+02 |
| Zn-65 | 1.1E+02 | Pm-148m | 1.0E+02 | U-234 | 2.9E+02 |
| Ge-68 | 5.6E+02 | Sm-145 | 2.4E+06 | U-235 | 6.7E+01 |
| As-73 | 5.3E+02 | Sm-146 | 4.0E+02 | U-236 | 3.1E+02 |
| Se-75 | 6.3E+01 | Sm-151 | 2.5E+05 | U-238 | 3.5E+02 |
| Se-79 | 8.7E+05 | Gd-146 | 5.1E+05 | Np-235 | 1.1E+02 |
| Rb-83 | 9.1E+01 | Gd-148 | 9.0E+01 | Np-236 | 2.1E+01 |
| Rb-84 | 2.0E+02 | Gd-151 | 2.9E+06 | Np-237 | 4.9E+01 |
| Sr-85 | 1.2E+02 | Gd-153 | 2.1E+02 | Pu-236 | 2.0E+02 |
| Sr-89 | 4.8E+05 | Eu-148 | 1.1E+06 | Pu-237 | 3.3E+02 |
| Sr-90 | 3.5E+04 | Eu-149 | 1.1E+07 | Pu-238 | 9.0E+01 |
| Y-88 | 3.3E+01 | Eu-152 | 3.1E+01 | Pu-239 | 8.4E+01 |
| Y-91 | 5.0E+04 | Eu-154 | 3.1E+01 | Pu-240 | 8.4E+01 |
| Zr-88 | 1.1E+02 | Eu-155 | 3.6E+02 | Pu-241 | 4.6E+03 |
| Zr-93 | 9.3E+04 | Tb-157 | 2.5E+03 | Pu-242 | 8.7E+01 |
| Zr-95 | 1.9E+02 | Tb-158 | 9.0E+04 | Pu-244 | 9.0E+01 |
| Nb-91 | 6.9E+01 | Tb-160 | 1.2E+02 | Am-241 | 7.2E+01 |
| Nb-91m | 3.6E+02 | Dy-159 | 1.0E+07 | Am-242m | 1.1E+02 |
| Nb-92 | 1.8E+01 | Ho-166m | 2.1E+01 | Am-243 | 7.3E+01 |
| Nb-93m | 4.4E+02 | Yb-169 | 5.5E+02 | Cm-241 | 1.0E+05 |
| Nb-94 | 2.3E+01 | Tm-170 | 8.4E+03 | Cm-242 | 6.2E+02 |

| Nuclide | Activity (μCi) | Nuclide | Activity (μCi) | Nuclide | Activity (μCi) |
|----------------|---|----------------|---|----------------|---|
| Nb-95 | 3.4E+02 | Tm-171 | 2.8E+04 | Cm-243 | 4.8E+01 |
| Mo-93 | 7.7E+01 | Hf-172 | 7.3E+04 | Cm-244 | 1.5E+02 |
| Tc-95m | 1.3E+02 | Hf-175 | 3.0E+06 | Cm-245 | 5.0E+01 |
| Tc-97 | 8.1E+01 | Hf-178m | 8.7E+03 | Cm-246 | 1.0E+02 |
| Tc-97m | 3.5E+02 | Hf-181 | 3.4E+02 | Cm-247 | 8.5E+01 |
| Tc-98 | 2.5E+01 | Hf-182 | 7.5E+03 | Cm-248 | 2.8E+01 |
| Tc-99 | 8.4E+05 | Lu-173 | 1.8E+06 | Cm-250 | 5.4E+00 |
| Rh-101 | 8.7E+05 | Lu-174 | 9.3E+05 | Bk-247 | 6.0E+01 |
| Rh-102 | 3.0E+05 | Lu-174m | 1.0E+06 | Bk-249 | 2.7E+04 |
| Rh-102m | 6.4E+05 | Lu-177m | 5.8E+01 | Cf-248 | 4.4E+02 |
| Ru-103 | 4.4E+02 | Ta-179 | 9.3E+06 | Cf-249 | 5.5E+01 |
| Ru-106 | 2.5E+02 | Ta-182 | 7.3E+01 | Cf-250 | 1.2E+02 |
| Ag-105 | 3.3E+06 | W-181 | 1.0E+03 | Cf-251 | 5.3E+01 |
| Ag-108m | 1.8E+01 | W-185 | 3.9E+06 | Cf-252 | 5.0E+00 |
| Ag-110m | 2.2E+01 | W-188 | 6.3E+04 | Cf-254 | 1.2E+02 |
| Pd-107 | 9.3E+06 | Re-183 | 5.3E+02 | Es-254 | 6.3E+01 |
| Cd-109 | 1.6E+02 | Re-184 | 2.6E+02 | Es-255 | 8.8E+03 |
| Cd-113m | 2.0E+04 | Re-184m | 1.5E+02 | Fm-257 | 5.1E+02 |
| Cd-115m | 1.0E+04 | Re-186m | 3.4E+05 | Md-258 | 6.1E+02 |
| Sn-113 | 3.1E+02 | Os-185 | 1.3E+02 | | |
| Sn-119m | 3.3E+02 | Os-194 | 6.4E+04 | | |

Any alpha emitting radionuclide not listed above and mixtures of alpha emitters of unknown composition have a value of 10 μCi .

Except as discussed below, any radionuclide other than alpha emitting radionuclides not listed above and mixtures of beta emitters of unk nown composition have a value of 100 μCi .

Any type of tritiated particulate aerosol or organically-bound tritiated compound has a value of 10 Ci.

Note: Where there is involved a combination of radionuclides in known amounts, derive the value for the combination as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the value otherwise established for the specific radionuclide when not in combination. If the sum of such ratios for all radionuclides in the combination exceeds unity (1), then the accountability criterion has been exceeded.